UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

Reply To
Attn Of: OW-137 March 17, 2003

Ref: 4-28-5w32-00000

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr Herman A. Williams, Jr.,
Chairman, Tulalip Tribes of Washington
The Tulalip Tribes
6700 Totem Beach Road
Tulalip, WA 98271

RE: Underground Injection Control (UIC)
Class V Injection Well Program
Rule Authorization: Large Capacity Septic System
Quil Ceda Village Treated Effluent Infiltration System
Quil Ceda Blvd between 93rd St. NE & 110th St NE
Tulalip, Snohomish County, Washington 98271
8802 27th Avenue NE,
Tulalip, WA 98271-9694
EPA File 4-28- 5W32-0001

Dear Mr. Williams:

Thank you for submitting your completed inventory, quality assurance project plan and sampling analysis plan for the proposed Quil Ceda Village Wastewater Effluent Infiltration System for the consolidated Borough of the Quil Ceda Village, Snohomish County, Washington which we received in July 2002 and January 2003. After reviewing your inventory data, we have determined that you will be operating a Class V disposal system as defined by 40 Code of Federal Regulations (CFR) Section 144.6. You are therefore regulated under the Underground Injection Control (UIC) Program requirements found in 40 CFR Parts 144, 146, and 147, which have been promulgated under Part C of the Safe Drinking Water Act, 42 United States Code Sections 1421 through 1428. Please see 40 CFR Part 144 Subpart G, which applies specifically to Class V injection wells.

Your Class V disposal system is currently "authorized by rule" under 40 CFR Sections 144.24 and 144.84(a). "Authorization by rule" allows you to operate your Class V disposal system. This rule authorization will remain valid for a period not to exceed five (5) years and for capacities not to exceed the maximum hydrologic capacity of 250,000 gallons per day. The operator shall notify EPA when flows reach 90 % or 225,000 gallons per day and inform EPA of the status of the National Pollution Discharge Elimination System (NPDES) permit application proposed for capacities above 250,000 gallons per day.

Your Class V disposal system must comply with, among other requirements, 40 CFR Section 144.12(a) which prohibits any underground injection that may endanger an underground source of drinking water. Your Class V disposal system is also subject to periodic compliance inspections, which may include sampling and analysis of your fluids. Although it is expected that the treated effluent injectate from the system will meet the federal drinking water standards, the operator will monitor the effluent to document compliance with federal drinking water quality standards utilizing the effluent monitoring parameters and frequency presented in the operator's application (See appendix A, Effluent Monitoring Parameters and Frequency, Table 5-1, operator's July 2002 application). In the event that monitoring indicates an exceedance of federal drinking water standards, the operator shall notify EPA within 24 hours of the exceedance.

The applicant shall assure all applicable UIC requirements under the safe drinking water act including construction, operations, monitoring, record retention, closure and all other requirements are met. The applicant shall submit a final construction completion report prior to initiation of Class V injection. Please forward the report and all EPA notifications to the attention of Thor Cutler, EPA (OW-137), 1200 Sixth Avenue, Seattle, WA, 98101. Finally, be aware that under 40 CFR Sections 144.12(c), (d), and (e), we can require you to apply for a permit or close your disposal system under certain circumstances (e.g., if all or part of the fluids you discharge changes from solely sanitary to mixed sanitary and industrial wastes).

Failure to comply with the above requirements will result in violations of UIC regulations and possible enforcement action.

Thank you for the opportunity to review and provide comments on this proposal. If you have any questions regarding these comments, please contact Mr. Thor Cutler, at (206) 553-1673 or by email at cutler.thor@epa.gov.

Sincerely,

Todd Bender

for Tim Hamlin, Manager
Ground Water Protection Unit

cc: Tom McKinsey, The Tulalip Tribes
Ken Fellows, Parametrix
M. Salazar, OGWDW
David Allnutt, R10-ORC

Application for Rule Authorization of Underground Injection Control Facility

Quil Ceda Village Treated Effluent Infiltration System

Submitted by

The Tulalip Tribes
8802 27th Avenue NE
Tulalip, WA 98271-7433

Prepared by

Parametrix
1231 Fryar Avenue
P.O. Box 460
Sumner, Washington 98390-1516
(253) 863-5128
www.parametrix.com

July 2002
Project No. 216-1598-012 (07/04)

CERTIFICATE OF ENGINEER

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

7/10/02

Prepared by Kenneth T. Fellows, P.E.

Checked by Michael T. Ollivant, P.E.

Approved by Doug Berschauer, P.E.

INVENTORY OF INJECTION WELLS

U.S. Environmental Protection Agency
Region 10 Underground Injection Control Program

SEE INSTRUCTIONS ON PAGE 3. This information is collected under the authority of the Safe Drinking Water Act, per the Underground Injection Control regulations at 40 CFR part 144.26 and reiterated at 144.83. This form is intended for use by injection well owners and operators in the State of Alaska and within Indian Country throughout EPA Region 10. Your responses should be typed or written legibly, signed and returned to EPA by regular mail. Please do not e-mail.

NOTE: Single-family dwellings and small capacity non-residential septic systems and cesspools, which are designed to serve fewer than 20 people, for the disposal of solely sanitary waste are not subject to these inventory requirements.

1. DATE PREPARED (mo/day/yr) 06/26/02

2. FACILITY ID NO. (leave blank if you do not have a RCRA ID)

3. TRANSACTION TYPE (please mark one)
__ Deletion X First Time Entry
__ Change (ex: ownership, type of well)
__ Pre-closure Notification

4. FACILITY INFORMATION

A. Facility Name Quil Ceda Village Treated Effluent Infiltration System

B. Street Address (do not use P.O. Box) Quil Ceda Blvd. between 93rd St. NE & 110th St. NE

*Latitude/Longitude Information and SIC code tables may be available from commercial Internet sites or from reference materials available at your local library.

Main Office: 8802 - 27th Avenue NE, Tulalip, WA 98271

C. *Latitude (deg/min/sec) 48° 05' 10" D. Longitude (deg/min/sec) 122° 11' 00"

E. SIC Code(s) 5399 , 7011

F. City/Town Tulalip G. State WA H. Zip Code 98271

I. County Snohomish J. On Tribal Land? Yes or No

5. LEGAL CONTACT

A. Type (Check all that apply): X Owner X Operator

B. Contact Name Reid Allison

C. Contact Organization Name The Tulalip Tribes

D. Contact Mailing Address 6700 Totem Beach Road

E. City/State/ZIP Tulalip, WA 98271

F1. Contact Telephone 360-651-4000 or Direct 360-651-3368

F2. Contact FAX 360-651-4032

F3. Contact E-mail aratulalip@aol.com G. Ownership: (check one) __ Private X Public

H. Please list any local, state or other permits on file with a regulatory agency for hazardous materials or hazardous waste management, or waste discharges, relevant to the use of your injection well(s). NONE

FOR EPA USE ONLY	Rec'd Date:	Entrd Dbase:
	Follow Up? Y or N	Staff:

CONTINUED NEXT PAGE.

6. WELL INFORMATION

A. sub-Class	B. # wells	C. Well Operation Status UC	AC	PC	TA	PA
5W32	19	X				
example: 5X28	*2*	*1*	*1*			

6D. Comments: (attach additional sheets as needed)

See remainder of document.

7. Certification Statement

I certify under penalty of law that I have read and understand the eligibility requirements of "authorization by rule" for operation of injection wells.

I certify under penalty of law that there are no discharges of hazardous substances or other fluids in amounts which may endanger an underground source of drinking water from the injection well(s) identified on this inventory form, per 40 CFR Part 144.12 and 144.82.

Additionally, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is to the best of my knowledge and belief true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name *(printed or typed)*:	Herman A. Williams, Jr.
Title:	Chairman, Tulalip Tribes of Washington
Signature:	Herman A. Williams Jr.

ONCE YOU HAVE COMPLETED THE FORM, SIGN (#7), MAKE COPY FOR YOUR OWN FILES AND MAIL **ORIGINAL(S)** TO:

U.S. Environmental Protection Agency
Ground Water Protection Unit, M/S OW-137
1200 Sixth Avenue
Seattle, WA 98101-1128

Questions about this form? Please call (206) 553-4141. For general questions about Safe Drinking Water Act programs at EPA, including the Underground Injection Control Program, see www.epa.gov/safewater, or call the Safe Drinking Water Act Hotline at (800) 426-4791, EST.

Table 6: Terms
UC: under construction
AC: active well
PC: Preclosure notice
TA: abandoned without notification/ approval by regulator
PA: permanently abandoned (closed) with notification/approval by regulator *(please list name of agency and date of approval in comment box)*

6A. Sub-Classes of Shallow Injection Wells

5A5 geothermal reinjectate
5A6 geothermal heat source
5A7 heat pump/AC return flow
5A8 geothermal aquaculture
5A19 cooling water return (specify contact or non-contact)

5B22 Saline Barrier/Intrusion Barrier

5D2 Stormwater drainage (precipitation, exterior wash only)

5D4 Stormwater combined with industrial or commercial process fluids

5F1 Agricultural drainage

5G30 Special drainage (define)

5R21 Aquifer Recharge, drinking water storage

5S23 Subsidence control

5W10 Cesspool

5W11 Septic System

5W12 Wastewater Treatment Plant Effluent

5W20 Combined sewage and industrial or commercial process fluids discharging to cesspool or septic system

5W32 Community leachfields, lagoons, or other effluent dispersal methods

5X13 Mining Backfill Well
5X14 Solution Mining Well
5X15 In-situ Fossil Fuel Recovery
5X16 Brine Return Flow

5X17 Air Scrubber Waste
5X18 Water Softener regeneration
5X25 Experimental Technology
5X26 Aquifer Remediation

5X27 Other (define)
5X28 Motor Vehicle Waste disposal

INVENTORY OF INJECTION WELLS - Instructions

U.S. Environmental Protection Agency
Region 10 Underground Injection Control Program

INFORMATION FOR OWNERS AND OPERATORS OF INJECTION WELLS SUBMITTING REGION 10 VERSION OF EPA FORM 7520-16

1. WHAT IS THIS REQUIREMENT?
Because more than half of the nation depends on underground sources of drinking water, subsurface waste disposal is regulated under the Safe Drinking Water Act. Such disposal systems are also called "injection wells", from multi-family septic systems to the deepest disposal wells pumping millions of gallons per day into the earth.

WHAT IS A SHALLOW INJECTION WELL? 144.3, revised 12/7/99, says a "well" is a bored, drilled, or driven shaft whose depth is greater than the largest surface dimension; or, a dug hole whose depth is greater than the largest surface dimension; or, an improved sinkhole; or, a subsurface fluid distribution system. A "subsurface fluid distribution system" is an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground. Septic systems, drywells, cesspools, seepage pits, percolation trenches, and drainfields, are common terms used to describe different types of shallow injection construction.

All owners/operators of injection wells are required to submit inventory information to U.S. EPA (or its delegated state representative) regarding the location and type of all injection wells operated. (40 CFR Part 144.26.) Updates are required any time there is a significant change in the status of the well, for example, when the well is closed, or when ownership changes. For more than 95% of all Class V wells, no federal permits will be required. Submission of accurate inventory information makes you "authorized by rule" to operate your injection well(s) provided that they are not used for the disposal of fluids which may endanger underground sources of drinking water.

SUPPLEMENTAL INVENTORY INFORMATION: Per 40 CFR Part 144.27, EPA may require owners and operators of injection wells to submit supplemental information pertaining to the operation of their injection well(s) if requested by EPA. Such information may include, well construction, history of use, depth to seasonal high water table, proximity to drinking water wells and surface water bodies, proximity to other injection wells, and proximity to federal, state, or tribally-designated Source Water Areas, Sole Source Aquifers, or other sensitive ground water areas.

2. SOURCE WATER ASSESSMENT PROGRAM: State drinking water programs are in the process of delineating areas where drinking water sources are located and/or recharged. More stringent regulations may apply to injection wells and other potential contaminant sources within these areas.

3. PAPERWORK REDUCTION ACT NOTICE: The public reporting burden for this collection of information is estimated at about 1 hour per year, including time for reviewing instructions, searching existing data sources, gathering and maintaining data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Chief, Information Policy Branch, 2136, U.S. Environmental Protection Agency, 401 M Street SW, Washington DC 20460, and to the Office of Management and Budget, Paperwork Reduction Project, Washington DC 20503.

4. CONFIDENTIAL BUSINESS INFORMATION: EPA has promulgated regulations to protect the confidentiality of the business information it receives. These regulations are set forth in 40 CFR part 2, subpart B, and in the Federal Register at 41 Fed. Reg. 36902 (9/1/76), 43 Fed. Reg. 4000 (9/8/78) and 50 Fed. Reg. 51661 (10/18/85). A claim of business confidentiality may be asserted in the manner specified in 40 CFR Section 2203(b) for part or all of the information requested. EPA will disclose business information covered by such a claim only as authorized under 40 CFR part 2, subpart B. If no claim accompanies the business information at the time the EPA receives it, EPA may make it available to the public without further notice. No facility may withhold from EPA any information on the grounds that it is confidential business information.

Additional information regarding these requirements can be obtained at www.epa.gov/safewater (see "Underground Injection Control, Class V") or by calling the Safe Drinking Water Act Hotline, (800) 426-4791, EST. To contact EPA Region 10's UIC Program, call (206) 553-4141.

NOTE: State and local governments may have more stringent ground water protection regulations.

Instructions and Definitions

Section 1. Date Prepared: Enter date in order of year, month, [illegible] y.

Section 2. Facility ID Number: In the first two spaces, insert the appropriate U.S. Postal Service State Code. In the third space, insert one of the following one letter alphabetic identifiers:

D - DUNS Number,
G - GSA Number, or
S - State Facility Number.

In the remaining spaces, insert the appropriate nine digit DUNS, GSA, or State Facility Number. For example, A Federal facility (GSA - 123456789) located in Virginia would be entered as: VAG123456789.

Section 3. Transaction Type: Place an "x" in the applicable box. See below for further directions.

- **Deletion.** Fill in the Facility ID Number.
- **First Time Entry.** Fill in all the appropriate information.
- **Entry Change.** Fill in the Facility ID Number and the information that has changed.
- **Replacement.**

Section 4. Facility Name and Location:

A. **Name.** Fill in the facility's official or legal name.
B. **Street Address.** Self Explanatory.
C. **Latitude.** Enter the facility's latitude (all latitudes assume North except for American Samoa).
D. **Longitude.** Enter the facility's longitude (all longitudes assume West except for Guam).
E. **Township/Range.** Fill in the complete township and range. The first 3 spaces are numerical and the fourth is a letter (N,S,E,W) specifying a compass direction. A township is North or South of the baseline, and a range is East or West of the principal meridian (e.g., 132N, 343W).
F. **City/Town.** Self Explanatory.
G. **State.** Insert the U.S. Postal Service State abbreviation.
H. **Zip Code.** Insert the five digit zip code plus any extension.

Section 4. Facility Name & Location (Cont'd.):

I. **Numeric County Code.** Insert the numeric county code from the Federal Information Processing Standards Publication (FIPS Pub 6-1) June 15, 1970, U.S. Department of Commerce. National Bureau of Standards. For Alaska, use the Census Division Code developed by the U.S. Census Bureau.
J. **Indian Land.** Mark an "x" in the appropriate box (Yes or No) to indicate if the facility is located on Indian land.

Section 5. Legal Contact:

A. **Type.** Mark an "x" in the appropriate box to indicate the type of legal contact (Owner or Operator). For wells operated by lease, the operator is the legal contact.
B. **Name.** Self Explanatory.
C. **Phone.** Self Explanatory.
D. **Organization.** If the legal contact is an individual, give the name of the business organization to expedite mail distribution.
E. **Street/P.O. Box.** Self Explanatory.
F. **City/Town.** Self Explanatory.
G. **State.** Insert the U.S. Postal Service State abbreviation.
H. **Zip Code.** Insert the five digit zip code plus any extension.
I. **Ownership.** Place an "x" in the appropriate box to indicate ownership status.

Section 6. Well Information:

A. **Class and Type.** Fill in the Class and Type of injection wells located at the listed facility. Use the most pertinent code (specified below) to accurately describe each type of injection well. For example, 2R for a Class II Enhanced Recovery Well, or 3M for a Class III Solution Mining Well, etc.
B. **Number of Commercial and Non-Commercial Wells.** Enter the total number of commercial and non-commercial wells for each Class/Type, as applicable.
C. **Total Number of Wells.** Enter the total number of injection wells for each specified Class/Type.
D. **Well Operation Status.** Enter the number of wells for each Class/Type under each operation status (see key on other side).

Injection Well Class and Type Codes

Class I Industrial, Municipal, and Radioactive Waste Disposal Wells used to inject waste below the lowermost Underground Source of Drinking Water (USDW).

Type	
1I	Non-Hazardous Industrial Disposal Well.
1M	Non-Hazardous Municipal Disposal Well.
1H	Hazardous Waste Disposal Well injecting below the lowermost USDW.
1R	Radioactive Waste Disposal Well.
1X	Other Class I Wells.

Class II Oil and Gas Production and Storage Related Injection Wells.

Type	
2A	Annular Disposal Well.
2D	Produced Fluid Disposal Well.
2H	Hydrocarbon Storage Well.
2R	Enhanced Recovery Well.
2X	Other Class II Wells.

[Cla]ss III Special Process Injection Wells.

Type	
3G	*In Situ* Gassification Well.
3M	Solution Mining Well.

Class III (Cont'd.)

Type	
3S	Sulfur Mining Well by Frasch Process.
3T	Geothermal Well.
3U	Uranium Mining Well.
3X	Other Class III Wells.

Class IV Wells that inject hazardous waste into/above USDWs.

Type	
4H	Hazardous Facility Injection Well.
4R	Remediation Well at RCRA or CERCLA site.

Class V Any Underground Injection Well not included in Classes I through IV.

Type	
5A	Industrial Well.
5B	Beneficial Use Well.
5C	Fluid Return Well.
5D	Sewage Treatment Effluent Well.
5E	Cesspools (non-domestic).
5F	Septic Systems (non-domestic).
5G	Experimental Technology Well.
5H	Drainage Well.
5I	Mine Backfill Well.
5J	Waste Discharge Well.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS (Continued)

APPENDICES

ACRONYMS

CBOD	Carbonaceous Biological Oxygen Demand
cfm	cubic feet per minute
cfs	cubic feet per second
EPA	United States Environmental Protection Agency
gpad	gallons per acre per day
gpd	gallons per day
gpm	gallons per minute
I&I	Infiltration and Inflow
I-5	Interstate Highway 5
MBR	Membrane Biological Reaction
MLSS	mixed liquor suspended solids
ND	Not Detected
POTW	Publicly Owned Treatment Works
QAP	Quality Assurance Plan
QMP	Quality Management Plan
SAP	Sampling and Analysis Plan
TKN	total Kjeldahl nitrogen
UIC	Underground Injection Control

1. INTRODUCTION

This document contains the inventory and assessment information required for rule authorization of a Class V injection well under the United States Environmental Protection Agency's (EPA) Underground Injection Control Program (40 CFR 144 and 40 CFR 146) for injection of treated sanitary wastewater effluent from The Tulalip Tribes' Quil Ceda Village (Village), just northwest of Marysville, Washington.

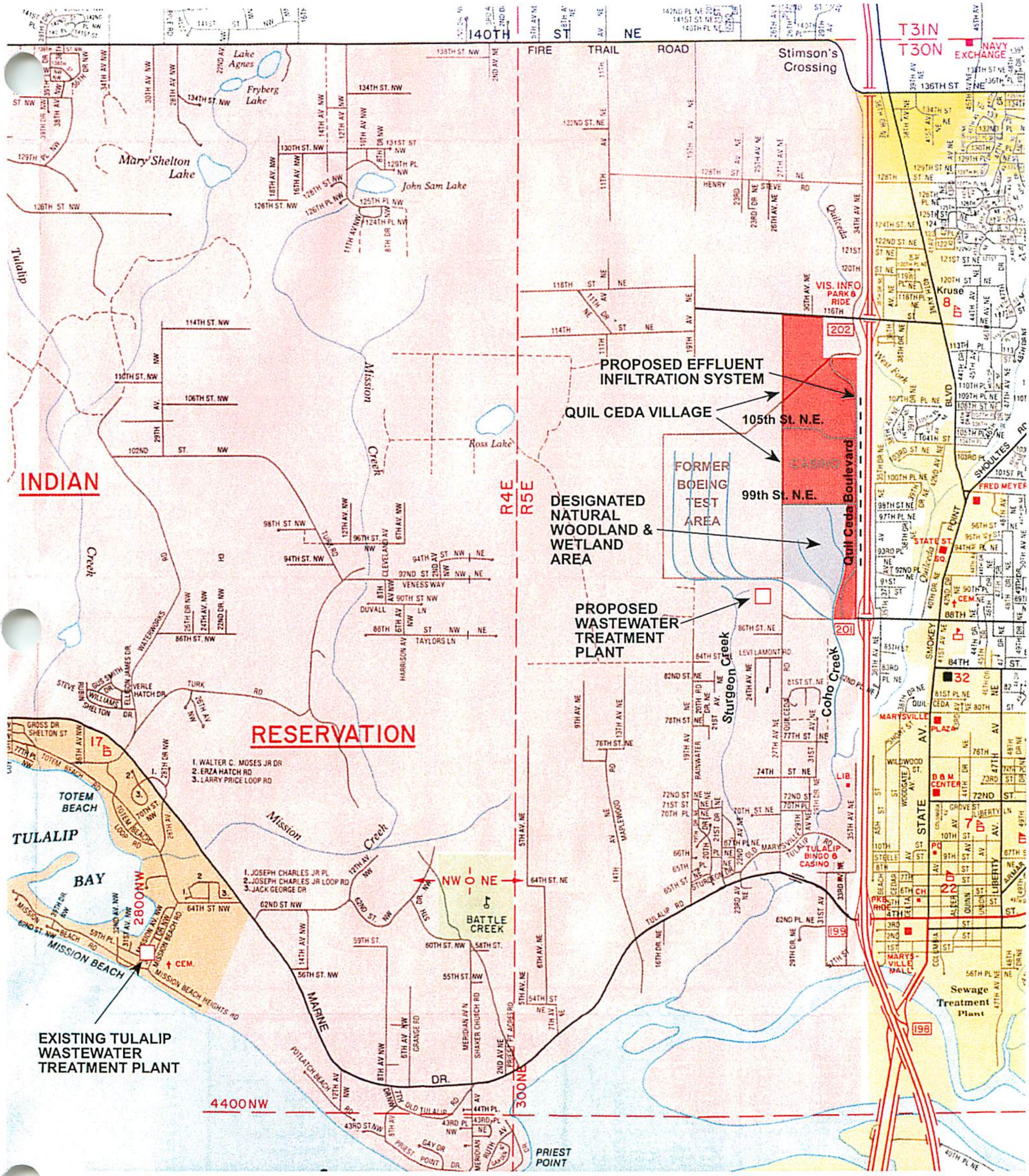
The Village is an existing retail shopping center located just west of Interstate Highway 5 (I-5) between the 88th Street NE and 116th Street NE interchanges (see Figure 1-1). Currently, a new casino is under construction and expected to be open for business in April 2003. Additional retail shopping facilities, a hotel, and a convention center are planned over the next several years. Ultimately, the Village may include amusement parks, electrical generating plants, and other businesses.

Currently, wastewater from existing Quil Ceda Village businesses is routed to the City of Marysville's Publicly Owned Treatment Works (POTW). The Tulalip Tribes have entered into contracts for design and construction of a new tribal-operated wastewater treatment plant to be located approximately one mile west of the 88th Street NE interchange with I-5. The proposed treatment plant will utilize a membrane-lined reactor to produce treated effluent that is expected to comply with federal drinking water standards. Plant startup is scheduled for February 2003. Village wastewater flows will be routed to the new plant; however, the option exists to continue to route up to 50,000 gallons of wastewater per day to the City of Marysville POTW.

Currently, wastewater flows from the Village are approximately 15,000 gallons per day (gpd). Following opening of the Casino in early 2003, flows are expected to increase to 70,000 to 200,000 gpd. Additional development occurring by 2005 to 2006 is expected to increase wastewater flows up to 250,000 gpd. Ultimately, at full buildout, Village wastewater flows are projected to be 4.0 million gpd, and the new tribal treatment plant is being designed to allow expansion to accommodate this flow rate.

Treated effluent from the plant will be disposed of by infiltration to groundwater. The Tribes has decided to obtain coverage under EPA's Class V UIC Program for this action. The limiting factor for the effluent infiltration system is anticipated to be hydraulic capacity (approximately 250,000 gallons per day, average basis). By 2006, wastewater flows are expected to exceed 250,000 gallons per day. Higher flows will require discharging effluent to surface water, which may require an NPDES Permit.

Based on the planned development schedule, Quil Ceda Village may need to obtain an NPDES permit for discharge of treatment effluent to surface water in late 2005. This schedule is based on the current development plans and corresponding wastewater flow rate projections, which indicate that future wastewater flow rates will exceed the capacity of the effluent infiltration system in 2006. The actual schedule for obtaining an NPDES discharge permit to surface water will depend primarily on when an NPDES permit is needed, as a result of effluent flow rates approaching the capacity of the effluent infiltration system. Future wastewater flow rates may be less than anticipated (due to the amount or type of development that actually occurs), or the capacity of the effluent infiltration system may be greater than anticipated. In either event, Quil Ceda Village may continue to rely on the effluent infiltration system for disposal of treated wastewater as long as it is feasible, which could be indefinitely. Quil Ceda Village will closely monitor and evaluate actual wastewater flow rates versus projected flow rates, and closely monitor the capacity of the effluent infiltration system, to ensure that a decision to obtain an NPDES permit is made in a timely manner.



N

Figure 1-1
Tulalip Reservation Vicinity Map

The Village has evaluated a range of options for infiltrating treatment wastewater to groundwater. The Tulalip Reservation is underlain by an unconfined aquifer in sandy soils extending to several hundred feet below ground surface. Depths to groundwater over most of the Reservation lowlands are less than 5 to 10 feet, and in some cases are as little as 1 to 2 feet; therefore, these areas are not suitable for infiltration. In a narrow strip of land parallel to and just west of I-5, depths to groundwater are greater (10 to 20 feet) where groundwater drainage to Quil Ceda Creek begins to lower the regional water table. This narrow strip of land is the area proposed for infiltration of effluent from the new wastewater treatment plant.

The Village completed a detailed investigation of site hydrogeologic conditions. This work has included completing 7 detailed soil borings, 8 cone penetrometer tests, 42 test pits, and 16 groundwater wells. Additionally, 4 long-term, high-volume infiltration tests were completed to evaluate aquifer properties and groundwater mounding. The information gathered from this study is supplemented by data from numerous other investigations of specific development sites around Quil Ceda Village. These other investigations have used soil borings, test pits, water level measurements, percolation tests, well pumping tests, and other methods to evaluate site conditions.

The Village also completed a study of expected water quality in the effluent from the proposed treatment plant. The results of this study indicate that the effluent will meet federal drinking water standards with a high degree of reliability. This study by the Village was completed on a pilot-scale membrane treatment system operated by the City of Duvall at their POTW in Duvall, Washington.

2. OWNER AND FACILITY INFORMATION

This section lists information describing the project owner and other facility information.

2.1 BASIC INFORMATION

Facility Name:	Quil Ceda Village Treated Wastewater Effluent Infiltration System.
Owner:	Quil Ceda Village, a federally-recognized Indian tribal village government affiliated with The Tulalip Tribes of Washington.
Name and Address of Legal Contact:	Mr. Reid Allison The Tulalip Tribes 6700 Totem Beach Road Tulalip, WA 98271
SIC Codes:	5399 – Miscellaneous General Merchandise Retail Stores 7011 – Casinos and Hotels
Type of Injection Well:	Class V
Operating Status:	New
Related Permits:	No federal or state permits applied for or received. All project environmental reviews are being completed by the Village.

2.2 TRIBAL STATUS

The Tulalip Tribes of Washington is a federally recognized Indian Tribe that has been organized under Section 16 of the Indian Reorganization Action of 1934, 25 U.S.C. Section 461, et seq. The Tulalip Tribes is located on the Tulalip Reservation in the middle Puget Sound area bordered on the east by I-5 and the City of Marysville, on the south by the Snohomish River, on the north by the Fire Trail Road (140th Street NE), and on the west by the waters of Puget Sound. The Tulalip Reservation exterior boundaries enclose a land-base of 22,000 acres, over 50 percent of which is in federal trust status. The Tulalip Reservation was established by the Point Elliott Treaty of 1855 and enlarged by Executive Order in 1873. The Tribes has approximately 3,200 enrolled members, of which approximately 2,000 live on the reservation.

2.3 TRIBAL GOVERNMENT

Figure 2-1 provides an organizational chart of The Tulalip Tribes' government, as applicable to the effluent infiltration system.

Quil Ceda Village is a federally recognized Indian tribal village government affiliated with The Tulalip Tribes. Quil Ceda Village (Village) is governed by an elected council. The City Manager is responsible for day-to-day management activities. Under the City Manager is a Public Works Director (position presently unfilled). Wastewater operations is one component of Quil Ceda Village public works.

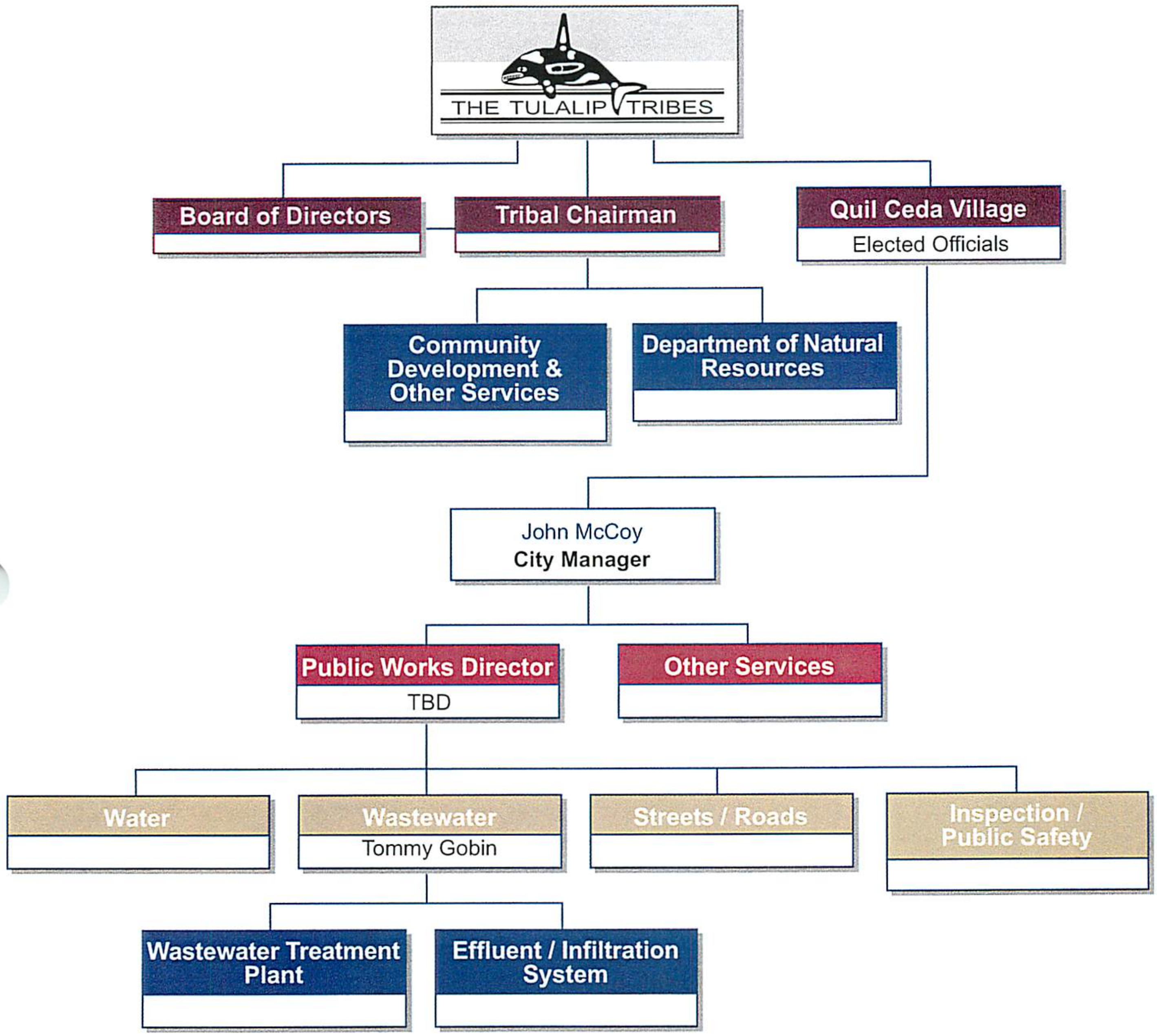


Figure 2-1
Tulalip Tribal Government Organizational Chart

Operation of the wastewater treatment plant and the effluent infiltration system will be the responsibility of the Plant Operator. Currently, the Plant Operator is Tommy Gobin. Mr. Gobin has 17 years experience in wastewater operations and holds the following certifications for treatment plant operation:

- Group 3 Wastewater Treatment Plant Operation, Native American Water Association, Expires 2005.
- Group 1 Water Treatment Manager, Native American Water Association, Expires 2005.
- Group 1 Water Distribution Specialist, Native American Water Association, Expires 2005.
- HAZWHOPPR Operations.

Mr. Gobin has previously been responsible for:

- Wastewater Plant Operations.
- Wastewater Testing and Process Control.
- Manager, Tulalip Utilities Water and Wastewater (8 years).

3. PROJECT/SITE CONDITIONS

This section describes the project hydrogeologic conditions. Figure 1-1 indicates the locations of streams and other surface water features. Figure 3-1 provides a topographic map.

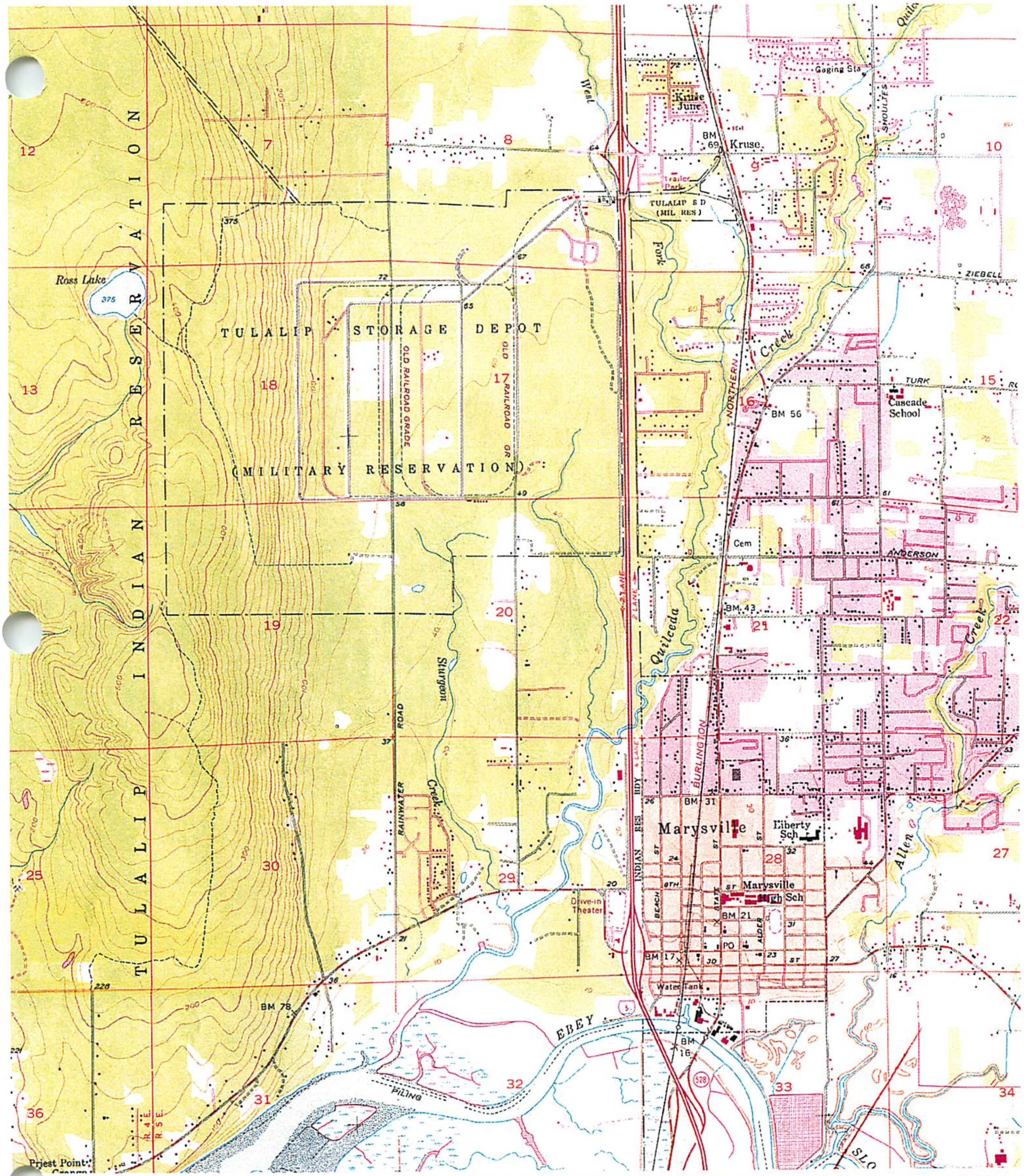
3.1 HYDROGEOLOGIC PHYSICAL INVESTIGATIONS AND CONCLUSIONS

The Village has completed a thorough investigation of site hydrogeologic conditions. Details of these investigations are provided in the appendices as follows and summarized below:

- Appendix A: *Summary of Geotechnical Studies, Effluent Infiltration Project, Tulalip, Washington* (AMEC Earth and Environment; March 15, 2002).
- Appendix B: *Groundwater Infiltration and Mounding Study* (Pacific Groundwater Group, May 2002.)

The Village's investigation of hydrogeologic conditions at the site has included completing 7 detailed soil borings, 8 cone penetrometer tests, 42 test pits, and 16 groundwater wells. Additionally, four long-term, high-volume infiltration tests were completed to evaluate aquifer properties and groundwater mounding. Figure 3-2 indicates the location of monitoring wells and infiltration tests sites. The information gathered from this study is supplemented by data from numerous other investigations of specific development sites around the Village. These other investigations have used soil borings, test pits, water level measurements, percolation tests, well pumping tests, and other methods to evaluate site conditions. Key conclusions derived from these investigations are:

- The uppermost aquifer is unconfined in generally sandy soils that extend hundreds of feet below ground surface.
- The silt content of aquifer soils increases (and hydraulic conductivity decreases) to the south and west of the Village. Highlands adjacent to the Marysville trough are generally comprised of low-permeability glacial till.
- Surficial soils (to a depth of up to 3 feet below ground surface) along the infiltration trench alignment are comprised of silty sands and topsoils that must be removed and replaced with higher permeable material.
- The groundwater surface is present at 2 to 4 feet below ground surface west of 27th Avenue East, dropping to 10 to 20 feet below ground surface adjacent to I-5.
- Groundwater flows east/southeast, discharging mainly to Quil Ceda Creek located to the east of I-5.
- Regional recharge is from precipitation, as well as from deep upwelling from infiltration occurring on the highlands to the west and east of the Marysville trough.
- Seasonal/long-term variations are estimated to be approximately 3 to 4 feet.



N

NOTE: Elevations in feet, NGVD29 Datum. Contour interval is 20 feet. Use for topography reference only. Refer to Figure 1 for site features and development.

Figure 3-1
Tulalip Reservation Topographic Map

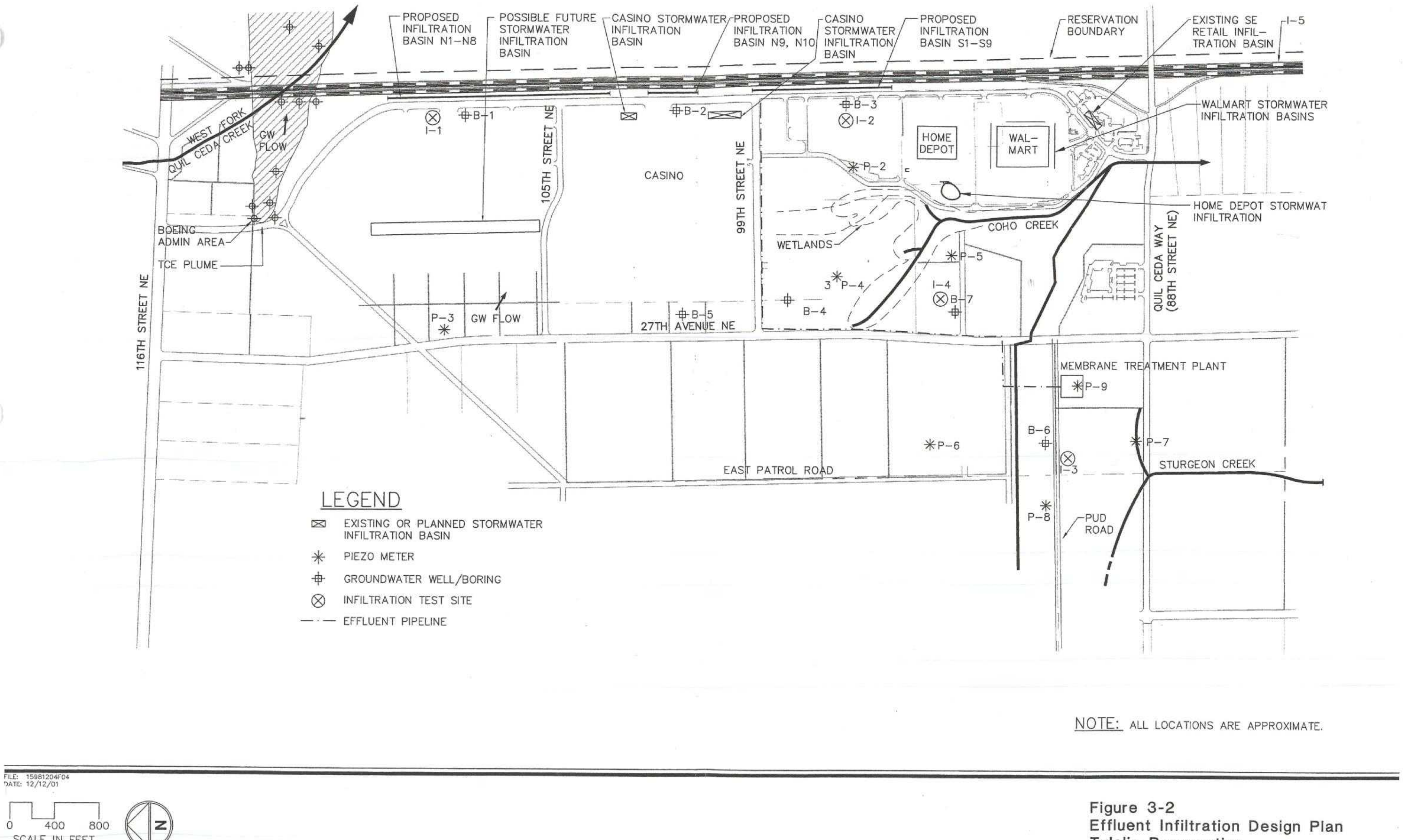


Figure 3-2
Effluent Infiltration Design Plan
Tulalip Reservation

The project geotechnical evaluation reviewed soil conditions in the Village as reported from hundreds of test pits and reviewed data from numerous percolation tests to develop a recommended maximum infiltration rate. Based on these studies, a vertical infiltration rate of 33 inches per hour was recommended. Several areas near the proposed effluent infiltration trench had infiltration rates that were much greater than 33 inches per hour, in some cases over 100 inches per hour. To account for data uncertainty and subsurface variability, a safety factor of three was applied to determine a long-term maximum allowable infiltration rate of 11 inches per hour.

Four high-volume, long-term infiltration tests were also completed to verify allowable infiltration rates as described above (see Figure 3-2). Appendix C provides a copy of the Infiltration Test Plan. The infiltration tests were completed in wood-lined pits, 12 feet by 12 feet by 2 feet deep, with flows of up to 45,000 gpd for 7 days duration. Each infiltration pit was surrounded by 12 piezometers, located in two lines extending perpendicularly from the pit. Along these lines, piezometers were located at 2, 10, and 50 feet from the pit walls to aid in evaluating groundwater mounding as functions of time and distance from the infiltration pits. At each location, both a shallow and a deep piezometer was installed to aid in evaluating vertical hydraulic gradients in groundwater. Shallow piezometers were installed to a depth of approximately 2 to 4 feet below the groundwater surface. Deep piezometers were installed approximately 15 feet below the groundwater surface. Specific conditions for the 4 infiltration tests are listed in Table 3-1.

Table 3-1. Summary of Infiltration Test Conditions and Results

Infiltration Test Site	Location	Depth to Groundwater (ft)	Flow Rate (gpd)	Infiltration Rate (in/hr)	Duration (days)	Mounding Observed (ft)
I-1	Along northern portion of proposed infiltration system alignment.	17	45,000[a]	21	7	<2
I-2	In vacant lot north of Home Depot, west of proposed infiltration system alignment.[b]	16	15,000[a]	7	7	<2
I-3	Northwest of 88th Street NE and 27th Avenue E, near proposed wastewater treatment plant.	3	Minimal[c]		7	To ground surface.
I-4	East of 27th Avenue E, South of Coho Creek.	5	Minimal[c]		7	To ground surface.

[a] Listed infiltration rates were selected to provide suitable test conditions and do not indicate maximum allowable infiltration rates. Flow for Test I-1 is believed to have been near the maximum allowable infiltration rate due to ponding of several inches at the bottom of the pit. Flow for Test I-2 caused no ponding in the bottom of the pit, indicating that the flow rate was much less than the allowable maximum.

[b] Prior conceptual designs of the infiltration system considered infiltration in this area.

[c] Infiltration reduced to essentially zero following initial filling of soil pores in the vadose zone.

Background
gw quality

3.2 GROUNDWATER QUALITY

Three groundwater wells (B-1, B-2, and B-3, see Figure 3-2) were sampled in April 2002 to evaluate existing groundwater characteristics prior to startup of the effluent infiltration system. Table 3-2 provides a summary of the results. Detailed results are provided in Appendix D. Sampling and analysis was performed in general accordance with applicable EPA methods. Field parameters (pH, dissolved oxygen, etc.) were measured using a groundwater pump and a flow-through measurement cell.

Table 3-2. Results of Groundwater Quality Investigation

Parameter	Units	Well B-1	Well B-2	Well B-3	Federal Drinking Water Standard	Federal Freshwater Maximum (Continuous) Surface Water Criteria[a]
Field Parameters						
Dissolved Oxygen	mg/L	6.6	2.0	8.3	None	8.0
pH	Std units	6.8	6.5	6.6	6.5–8.5	6.5–9
Specific Conductivity	umhos/cm	21	27	23	None	None
Redox	mV	340	360	350	None	None
Conventional Parameters						
Alkalinity	mg/L	5.5	16	6.6	None	>20
Ammonia	mg/L	<0.01	<0.01	<0.01	None	30(3.4)[b]
Chemical Oxygen Demand (COD)	mg/L	<5.0	5.5	<5.0	None	TBD
Chloride	mg/L	2.3	1.7	1.6	250	None
Coliform Bacteria	MPN/100 ml	<1	<1	<1	1.0	100
Cyanide	µg/L	<0.005	<0.005	<0.005	0.2	0.022 (0.0052)
Fluoride	mg/L	<0.1	0.1	<0.1	2.0	None
Hardness (calculated)	mg/L	16	36	13	None	None
Nitrate as N	mg/L	2.2	1.7	0.4	10	None
Nitrite	mg/L	<0.1	<0.1	<0.1	10	None
Nitrogen (TKN)	mg/L	<0.5	<0.5	<0.5	None	None
Organic Carbon (TOC)	mg/L	1.6	2–3	<1	None	None
Ortho-Phosphate (as Phosphorus)	mg/L	0.011	0.02	0.015	None	TBD
Phosphorus, organic (calculated)	mg/L	0.010	0.18	0.079	None	TBD
Phosphorus, total	mg/L	0.021	0.20	0.094	None	TBD
Sulfate	mg/L	4.5	10.0	9.7	250	None
Total Dissolved Solids	mg/L	50	63	44		None

(Table Continues)

Table 3-2. Results of Groundwater Quality Investigation (Continued)

Parameter	Units	Well B-1	Well B-2	Well B-3	Federal Drinking Water Standard	Federal Freshwater Maximum (Continuous) Surface Water Criteria[a]
Metals[c]						
Arsenic	mg/L	<0.05	<0.05	<0.05	0.01	0.34 (0.15)
Cadmium	mg/L	<0.002	<0.002	<0.002	0.005	0.0043 (0.0022)[d]
Calcium	mg/L	4.1	6.6	3.1	None	None
Chromium, total	mg/L	0.052	0.071	0.034	0.1	0.57 (0.074)
Chromium, hexavalent	mg/L	<0.01	<0.01	<0.01	0.1	0.016 (0.011)
Copper, dissolved	mg/L	0.0002	0.0006	0.0003	1.0	0.013 (0.009)[d]
Copper, total	mg/L	0.004	0.013	0.004	1.0	None
Iron	mg/L	1.1	7.7	1.2	0.3	(1.0)
Lead, dissolved	mg/L	<0.0002	<0.0002	<0.0002	0.05	0.065 (0.0025)[d]
Lead, total	mg/L	<0.001	<0.001	<0.001	0.05	None
Magnesium	mg/L	1.4	4.7	1.4	None	None
Manganese	mg/L	0.018	0.41	0.019	0.05	None
Mercury	mg/L	<0.0001	<0.0001	<0.0001	0.002	0.0014 (0.00077)
Nickel	mg/L	0.03	0.05	0.02	0.1	0.47 (0.052)[d]
Selenium	mg/L	<0.002	<0.002	<0.002	0.05	(0.005)[d]
Silver	mg/L	<0.0002	<0.0002	<0.0002	0.1	3.4
Sodium	mg/L	3.3	4.1	2.9	None	None
Zinc, dissolved	mg/L	0.002	0.005	0.002	5.0	0.12 (0.12)[d]
Zinc, total	mg/L	0.015	0.03	0.011	5.0	None
Organics						
Herbicides/Pesticides	µg/L	N/A	None detected	N/A	N/A	
Volatile organics	µg/L	N/A	None detected[e]	N/A	N/A	

Note: NA = Not Analyzed, ND = Not Determined, TBD = To Be Determined, if limit is necessary.

a See Quality Assurance Project Plan (Appendix J-2) for complete list, including human health criteria for consumption of aquatic organisms.

b Calculated using pH of 6.7.

c Total recoverable metal concentrations shown unless otherwise indicated. Surface water criteria apply to dissolved metal concentrations.

d Surface water criteria are hardness dependent. Value shown is calculated using hardness of 100 mg/L.

e Typical detection limit was 0.2 mg/L.

3.3 SURFACE WATER QUALITY AND FLOW RATES

Groundwater moving under the area of the proposed effluent infiltration system flows east/southeast to the lower portion of Quil Ceda Creek. Water quality in lower Quil Ceda Creek (upstream side of the 88th Street NE bridge) was sampled five times in 2001 as part of Snohomish County's *Ambient Water Quality Program* (Ecology, 2001). Results of this sampling work are summarized in Table 3-3. The primary water quality parameters of interest in recent studies of Quil Ceda Creek were dissolved copper, lead, and zinc; however, concentrations of these metals were measured to be substantially below State freshwater quality standards. Quil Ceda Creek is not listed on Washington State's 303(d) list of impaired water bodies.

Table 3-3. Summary of Water Quality Data for Lower Quil Ceda Creek

Parameter	Units	Long-Term Average	Range
Field Parameters			
Dissolved Oxygen	mg/L	10.90	10.4 to 12.5
pH	Standard Units	7.20	7.1 to 7.5
Specific Conductivity	umhos/cm	151.00	137 to 201
Temperature	Degrees C	9.90	4.4 to 15.5
Conventionals			
Coliform Bacteria	Col./100 mL	260.00	57 to 260
Hardness	mg/L	69	59 to 83
Nitrate+Nitrite	mg/L	1.10	0.8 to 1.1
Phosphorus, total	mg/L	0.11	0.09 to 0.13
Total Suspended Solids	mg/L	6.00	1 to 12
Turbidity	NTU	5.20	2.8 to 8.0
Metals			
Copper, dissolved	µg/L	0.60	0.3 to 0.8
Copper, total	µg/L	2.00	0.7 to 4
Lead, dissolved	µg/L	0.07	0.03 to 0.2
Lead, total	µg/L	0.30	0.2 to 0.6
Zinc, dissolved	µg/L	2.00	0.7 to 4
Zinc, total	µg/L	5.00	3 to 8

Groundwater quality as measured in Wells B-1, B-2, and B-3 appears similar to surface water quality in Quil Ceda Creek for nitrate, total phosphorus, and total and dissolved copper, lead, and zinc. Groundwater has a slightly lower pH, hardness, and specific conductivity than surface water.

Flow data in cubic feet per second (cfs) for lower Quil Ceda Creek indicates the following:

Quil Ceda Creek Flows	Flow Rate (cfs)
Year 2000 Summer/Fall Flow	6 to 7
Annual Average Flow	28
One-year Peak Flood Flow	95

The proposed rates of effluent infiltration below are much less than the Quil Ceda Creek flows listed above.

Effluent Infiltration Flow Rate	Flow Rate (cfs)
First year average (70,000 to 200,000 gpd)	0.1 to 0.3
Third year average (250,000 gpd)	0.4

3.4 DRINKING WATER WELL INVENTORY

The Village has completed an inquiry to determine the locations of known drinking water wells within $^1/_4$ mile of the proposed effluent infiltration system. No drinking water wells within $^1/_4$ mile were identified to the north, west, or south of the system. Approximately 14 individual domestic drinking water wells and one Group B public water system with 10 connections were identified on the east side of I-5, at least 400 feet from the proposed system. Some of these wells may draw from the upper-most unconfined aquifer. A map and available records for these wells are provided in Appendix B.

The City of Marysville recently expanded its water supply system service area to include the entire area east of I-5 between 88th Street NE and 116th Street NE, which includes the areas where these wells are located. It is expected that residences currently obtaining their drinking water from wells will soon connect to the City of Marysville system.

4. DESCRIPTION OF FACILITIES

4.1 DESCRIPTION OF QUIL CEDA VILLAGE

Quil Ceda Village will become an economic engine and source of income and employment for the members of The Tribes and their future generations. The Village is located along the eastern boundary of the Tulalip Reservation, just west of I-5 between the 88th Street NE and 116th Street NE interchanges (see Figure 1-1).

This 2,000-acre Village has been estimated to include approximately 1,350 acres of developable property. For the purposes of wastewater planning, the Village separated the development into three segments or phases (see Figure 4-1). Phase 1 includes approximately 330 acres of land between I-5 and 27th Avenue. Phase 2 includes approximately 240 acres of land just west of 27th Avenue, and Phase 3 includes approximately 750 acres of land between Phase 2 and a natural ridge located approximately $1^1/_2$ miles west of and parallel to I-5.

Phase 1 of the Village includes the Bingo Hall, Wal-Mart, and Home Depot. Additionally, a new casino is expected to open in April 2003. Future Village development may include amusement parks, electrical generating plants, a university extension campus, hotels, business offices, restaurants, and more retail stores (see Figure 4-2).

4.2 EXISTING WASTEWATER FLOWS AND TREATMENT

Currently, all Phase 1 Village development wastewater is conveyed to the Marysville WWTP. The Tulalip Tribes executed an agreement with the City of Marysville for 50,000 gallons per day (gpd) of treatment and conveyance capacity. This agreement enabled The Tribes to meet the short-term wastewater treatment needs to begin the construction of the Village, including the Tulalip Bingo Hall, Wal-Mart, and Home Depot. Sewage flow to Marysville began in 1999 when The Tribes installed a pump station at the corner of 88th Street NE and Quil Ceda Boulevard and a 4-inch force main under I-5 to connect to the City of Marysville sewer system.

In 1990, Parametrix prepared a Wastewater Feasibility Study for The Tulalip Tribes. The Study investigated the feasibility of installing on-site septic systems, septic tank effluent pumps, or gravity systems for the proposed Village. This report contained commercial wastewater flow projections of 1,700 gallons per acre per day (gpad) and "normal" Infiltration and Inflow (I&I) projections of 500 gpad. Since the issuance of this report, The Tulalip Tribes have continued to use 1,700 gpad for projected commercial wastewater flow and 500 gpad for projected I&I flow.

Following development of the Bingo Hall, Wal-Mart, and Home Depot, an evaluation of wastewater flows revealed that actual flows are well below the 1,700 gpad commercial flow estimate and the current level of system I&I is well below the projected 500 gpad. These findings allowed The Tribes to add a retail center at the northeast corner of Quil Ceda Boulevard and 88th Street without exceeding the 50,000-gpd allocation; however, prior to allowing any further development that might exceed the 50,000-gpd allocation, The Tulalip Tribes needed to establish a long-term wastewater treatment solution.

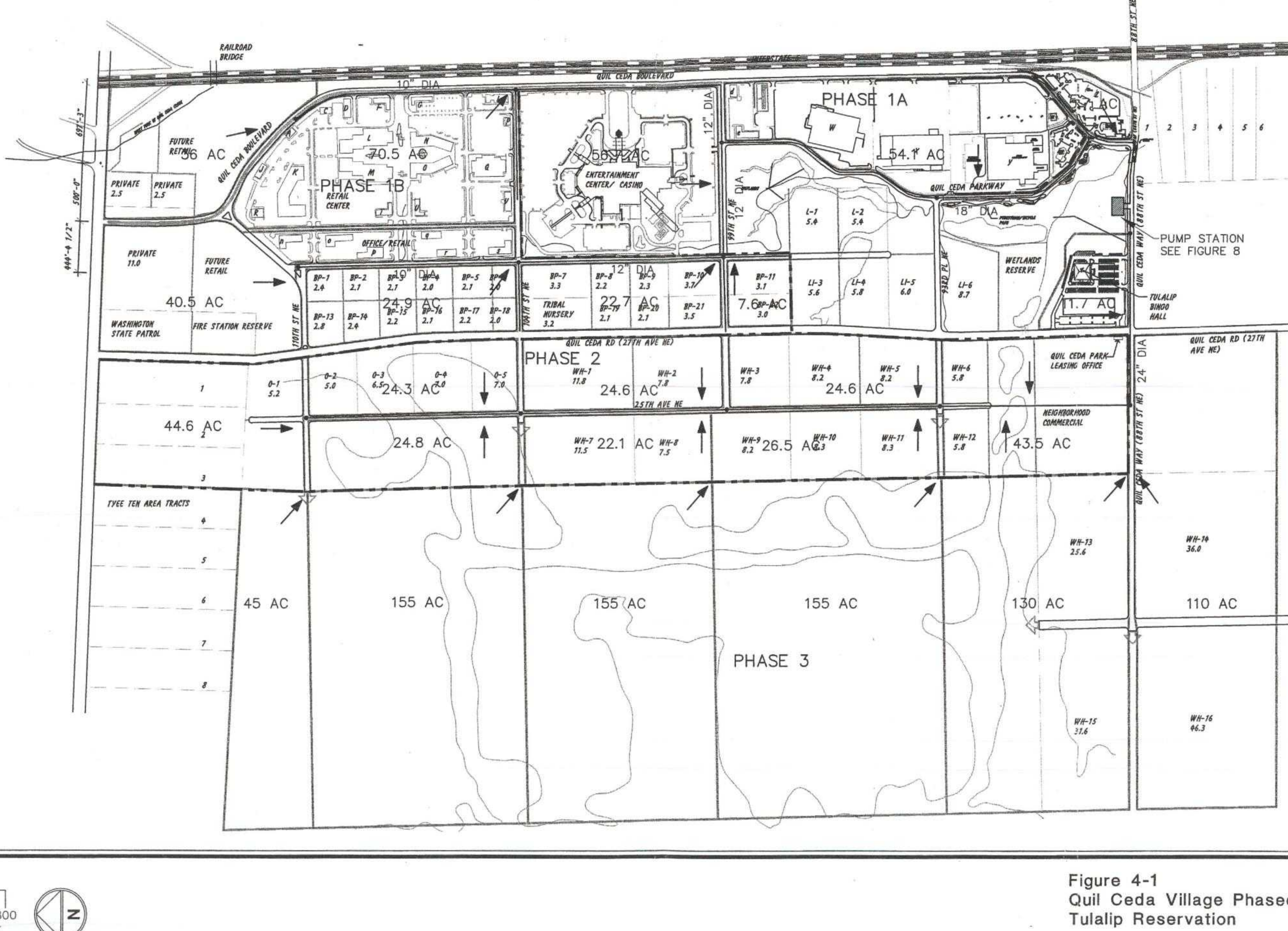


Figure 4-1
Quil Ceda Village Phased Development
Tulalip Reservation

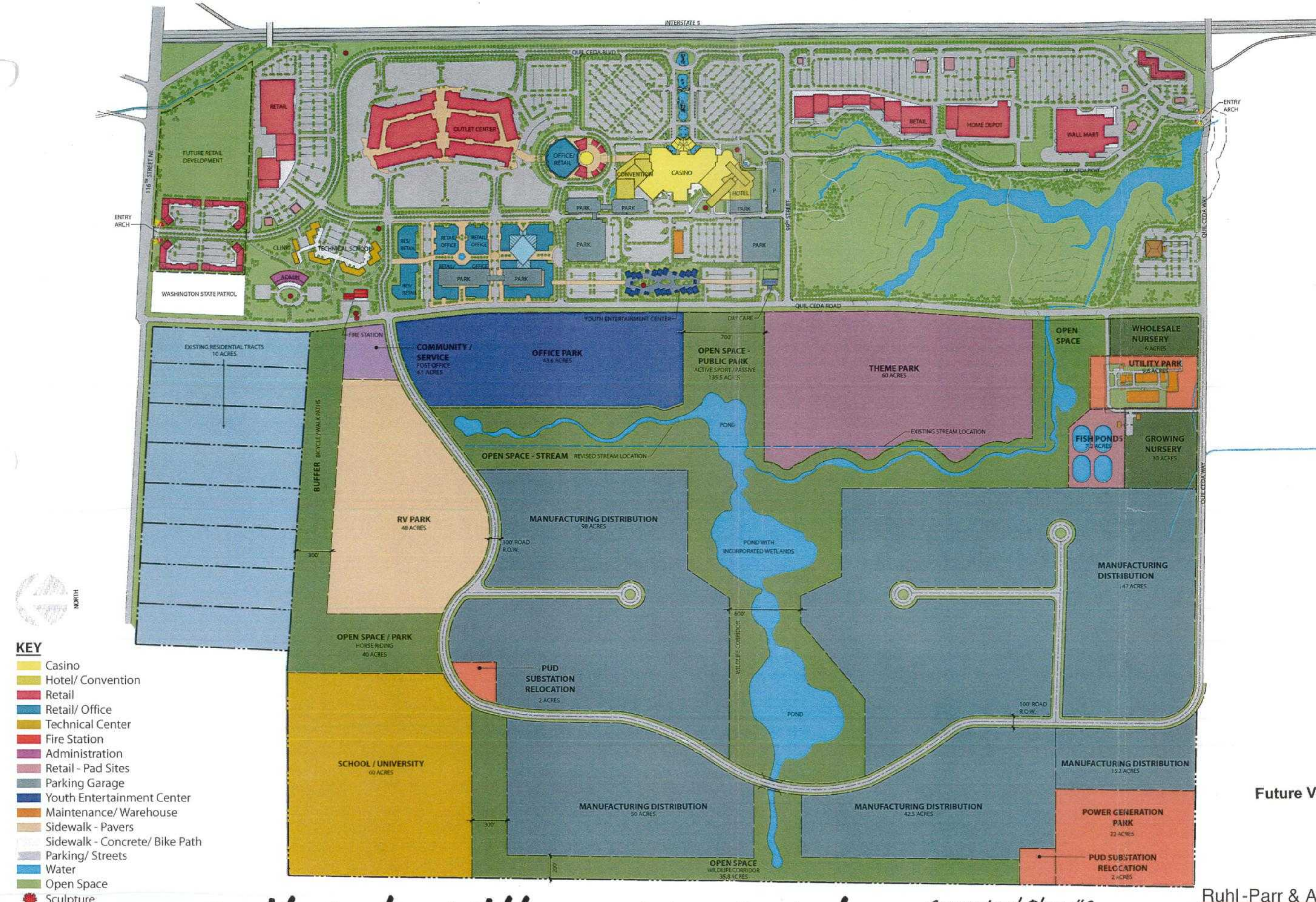


Figure 4-2
Future Village Development

Quil Ceda Village Masterplan

Conceptual Plan #2

Tulalip, Washington *Not to Scale*

Ruhl-Parr & Associates, P.S.
Architects - Planners
A VelociTel Company

April 2002

In November of 2001, Parametrix prepared a projection of Short-Term Wastewater Flows. The wastewater flow projection included the Home Depot, Wal-Mart, Bingo Hall, Casino Phase I and II, and Chelsea Outlet Mall. The wastewater flows for the existing structures were projected based upon the 88th Street and Quil Ceda Boulevard pump station flowmeter records. The projected wastewater flows for the Casino were based upon the flow records for the existing Tulalip Casino. The Developer, based upon flow records for similar outlet centers, supplied the wastewater flow estimates for the Chelsea Outlet Mall.

Total wastewater flows have been projected to be between 174,000 and 200,000 gpd (see Appendix E, Table 4). A capacity buffer has been projected by comparing the 174,000- to 200,000-gpd wastewater flow with the infiltration design limit of 250,000 gpd. The infiltration basins should have the capacity to infiltrate between 50,000 and 76,000 gpd of additional effluent.

4.3 FUTURE WASTEWATER FLOWS AND TREATMENT

Table 4-1 summarizes projected wastewater flows expected upon completion of each of the development phases of the Village. Annual wastewater flow projections are provided in Appendix E.

Table 4-1. Long-Term Wastewater Flow Projections

Phase	Projected Year Completed	Projected Wastewater Flow (gpd)	Projected I&I Flow (gpd)	Maximum Month Projected Flow (gpd)
1A	2005	120,000	40,000	160,000
1B + Casino	2007	780,000	160,000	940,000
2	2011	1,230,000	290,000	1,520,000
3	2020	2,530,000	680,000	3,210,000

The Village examined several alternatives for meeting their wastewater treatment needs, and ultimately selected as their preferred treatment method the installation of a Membrane Biological Reaction (MBR) wastewater treatment plant.

Long-term wastewater flow projections were again based upon 1,700 gpad of commercial flow and 500 gpad of I&I. While the initial comparisons of the projected and actual flows seem to indicate that these numbers may be overly conservative, The Tribe considers these flow projections conservative enough for the preliminary projection. The wastewater flow projection numbers may be modified to more closely reflect the actual wastewater flow as construction progresses through the Village. Based upon the initial projection data, maximum month wastewater flow for the Village should be approximately 3 mgd and a peak-hour loading of 7.8 mgd (see Appendix E). As listed in Section 4.5.3, treatment plant monthly and peak-hour design flows are 4.0 and 9.0 mgd, respectively.

Short-term wastewater flow to the MBR plant and development within the Village will be limited by the ability to infiltrate treated effluent under the Underground Injection Control (UIC) Program. Currently, the design infiltration limit is 0.25 mgd. This preliminary design limit has been established through groundwater modeling. A more complete description of the UIC basin and design parameters has been included in Section 4.6 of this report.

The Village ultimately desires to use the treated effluent to augment several proposed projects. These projects include landscape irrigation, nonpotable water use inside Village buildings, salmon rearing ponds, constructed wetlands, and stream augmentation.

4.4 PRETREATMENT

The Village is very concerned about maintaining a consistently high-quality effluent so that groundwater or surface water is not degraded and wastewater treatment plant sludge quality is not impaired. The Village recognizes that a credible wastewater pretreatment program is a key component to achieving this goal. Pollutants of concern could originate from sources as diverse as photo processing, vehicle and facility maintenance shops, and heavy industry.

Currently, there are no industrial processes in the Village that discharge to the sanitary sewer. Gas stations discharge only sanitary waste to the sewer system. No auto shops, dry cleaners, or other similar businesses are located, or planned to be located, in the Village.

The Village has developed a preliminary pretreatment regulation to aid in managing discharges to the sewer. A copy of the regulation is provided in Appendix F. The industrial waste program is intended to control the discharge of hazardous substances and oils and greases that could be detrimental to the sewer system, including the new wastewater treatment plant. The three key elements of the program are:

- Restrictions on the types of businesses and industries that will be accepted as tenants in the Village.

- Requirement for pretreatment of discharges containing pollutants of concern from businesses and industries.

- Prohibition of certain substances in discharges to the sewer system.

Decisions regarding these issues will be made by the City Manager, acting upon recommendations from the Public Works Director and the Department of Natural Resources. The Village will obtain the assistance of outside experts, if necessary.

4.5 PROPOSED WASTEWATER TREATMENT PLANT

4.5.1 Overview

This section provides an overview of the proposed wastewater treatment plant for the Village. Figure 1-1 shows the proposed location for the treatment plant.

4.5.2 Treatment Plant Description

The wastewater treatment plant is an activated sludge plant that will include nitrogen removal. Vendor literature and preliminary plans are provided in Appendix G. The plant will use flat plate membranes (Kubota) to separate the effluent (permeate) from the activated sludge in lieu of mechanical clarification. The use of membranes allows the plat to operate at a concentration of mixed liquor suspended solids (MLSS) in the range of 10,000 to 15,000 mg/L. This greatly reduces the amount of volume necessary to treat the wastewater compared to a typical activated sludge type wastewater treatment plant. Additional tankage is provided to create an anoxic environment for nitrogen removal. Recycle pumps will send approximately five times the influent flow back to the anoxic tanks from the aerobic membrane bioreactors. This will allow the denitrification of the recycled biomass that has been nitrified in the aerobic zone. This level of recycle will allow for around 80 percent reduction in overall nitrogen.

Air supplied to membranes will provide oxygen to the biomass and clean the membranes at the same time. Supplemental air will be required as flows approach design. A separate aeration basin has been provided to ensure adequate oxygen is supplied.

The flat plate membranes are in cassettes of 800. These are stacked units with 400 in each level of the stack. The distance between the membranes is $^1/_8$ inch. This small tolerance requires adequate screening of the influent to insure that nothing will get lodged in between the membranes or potentially damage the membranes. A primary screen ($^1/_4$ inch) will be located at the pump station upstream from the treatment plant. A secondary ($^1/_8$ inch) screen will be located at the treatment plant. This screen is located just downstream of a grit removal system.

The membranes provide significant disinfection since most bacteria are larger than the effective pore size of .1 micron. A chlorine residual is being provided for all reuse water being sent to the Village for flushing, fountains, ponds, and irrigation. Ultraviolet (UV) disinfection is provided for the discharge to the effluent infiltration system as a backup to the membranes and to kill viruses in the effluent.

4.5.3 Wastewater Treatment Plant Design Criteria

The wastewater treatment plant was designed using the following criteria:

- **Phase I Criteria**
  - 0.75 mgd Maximum Month Flow
  - 2.5 mgd Peak Hour Flow
- **Ultimate Criteria**
  - 4.0 mgd Maximum Month Flow
  - 9.5 mgd Peak Hour Flow

- **Headworks**
  - ➢ Screen ($^1/_8$-inch perforated screen): One screen at Phase 1, second installed as flow dictates.
  - ➢ Prescreen ($^1/_4$ inch): Located at upstream pump station.
  - ➢ Grit Removal (Twin "Grit King" units): One installed at Phase 1, second installed as flow dictates.
- **Pre-MBR Tanks**
  - ➢ One Post MBR Basin (recycle from MBR basins; design flow is five times the plant influent flow rate): Required to lower dissolved oxygen level in activated sludge to allow for anoxic conditions in next basin; May be used as anaerobic tank in the future; Level of recycle needed for nitrogen removal.
  - ➢ Two Anoxic (Denitrification) Basins: 21 feet by 21 feet; 66,000 gallons at 19-foot water depth.
  - ➢ One Pre-MBR Tank: Aeration as required; 14 feet by 43 feet; bottom elevation at 10 feet; Aeration not needed until flow is approximately 0.6 mgd.
  - ➢ Three Mixers: Complete mixing in Post MBR and Anoxic Basins.
- **MBR Tanks**
  - ➢ Four Tanks: 14 feet by 29 feet 7 inches; Water depth 19.5 feet to 22.5 feet.
  - ➢ 24 Total Double Stack Membrane Units: 8 per tank; one tank for overflow purposes only.
  - ➢ Air Requirements: 790 cubic feet per minute (cfm) minimum and 850 cfm maximum per tank; Coarse air.
- **Recycle**
  - ➢ Six Pumps Total: 3 per side; Phase 1 maximum flow – 1.25 mgd per tank.
- **Layout and Controls**
  - ➢ See Process and Instrumentation Diagram in Appendix G.

4.5.4 Pilot-Observed/Predicted Effluent Quality

No major plate-type membrane treatment plants of the type proposed have been operated in the United States. Plate-type membrane treatment plants have been successfully operated elsewhere in the world; however, significant high-quality effluent monitoring data was not readily available. Therefore, the Village obtained permission to sample the effluent from a membrane pilot plant operated by the City of Duvall at the POTW in Duvall, Washington. The pilot plant operated at a flow rate of approximately 7 gallons per minute (gpm).

Table 4-2 summarizes the results of testing the pilot plant effluent. An extensive list of analytes were evaluated; only detected compounds are listed. Effluent from the pilot plant was sampled for seven consecutive weeks. Samples for all substances, other than volatile compounds, were obtained using an automated 24-hour compositing sampler. Samples for volatile compounds were collected as grabs. The City of Duvall sampled for typical effluent parameters of interest, and in general, supplemental sampling by the Village did not duplicate the City of Duvall's work. Fecal coliform data were not collected, as the pilot plant did not have a disinfection system. Analytical results from testing of the pilot-plant effluent are provided in Appendix H.

Table 4-2. Summary of City of Duvall Pilot Plant Effluent Test Data (Detected Compounds Only)

Parameter	Units	The Village's Data	City of Duvall Data	Federal Drinking Water Standard	Federal Freshwater Maximum (Continuous) Surface Water Criteria
Conventionals (average concentration)					
Ammonia	mg/L	–	0.6	None	30 (3.4)[a]
Calcium Carbonate	mg/L	–	51.0	None	None
CBOD	mg/L	–	1.4	None	TBD
Dissolved Oxygen	mg/L	–	5.9	None	8.0
Fluoride	mg/L	0.4	–	2.0[b,c]	None
Nitrate as N	mg/L	6.3	9.3	10.0[b]	None
Nitrite as N	mg/L	0.02	–	1.0[b]	None
Nitrogen, TKN	mg/L	–	2.7	None	None
pH	Std Units	–	6.1 – 7.5	6.5 to 8.5[c]	6.5-9.0
Total Dissolved Solids (TDS)	mg/L	171.0	–	500[c]	None
Total Suspended Solids (TSS)	mg/L	–	0.4	None	None
Metals (average concentration)[d]					
Aluminum	mg/L	0.05	–	0.05/2.0[c]	0.75 (0.087)
Arsenic	mg/L	<0.01	–	0.01[b]	0.34 (0.15)
Copper	mg/L	0.02	0.004	1.0[c]	0.013 (0.009)
Lead	mg/L	<0.0005	–	0.05[b]	0.065 (0.0025)
Manganese	mg/L	0.07	–	0.05[c]	None
Mercury	mg/L	<0.0002	–	0.002[b]	0.0014 (0.00077)
Zinc	mg/L	0.04	0.021	5.0[c]	0.12 (0.12)
Organic Compounds (detected compounds only, maximum concentrations listed)					
Bis(2-ethylhexyl)phthalate	µg/L	0.001	–	0.006[b]	0.0059[e]
Bromodichloromethane	µg/L	0.002	–	0.08[b]	None

(Table Continues)

Table 4-2. Summary of City of Duvall Pilot Plant Effluent Test Data (Detected Compounds Only) (Continued)

Parameter	Units	The Village's Data	City of Duvall Data	Federal Drinking Water Standard	Federal Freshwater Maximum (Continuous) Surface Water Criteria
Organic Compounds (detected compounds only, maximum concentrations listed) Continued					
Chloroform	μg/L	0.007	–	0.08[b]	0.47[e]
Dichlorobenzene, 1,4-	μg/L	0.00008	–	0.095[b]	2.6[e]
Endrin	μg/L	0.00003	–	0.002[b]	0.000086 (0.000036)
Pentachlorophenol	μg/L	0.0009	–	0.001[b]	0.007 (0.005)[d]
Styrene	μg/L	0.00009	–	0.1[b]	None
Toluene	μg/L	0.0002	–	1.0[b]	200

Note: TBD = To Be Determined.

a Calculated as pH of 6.7.

b Primary standard. Enforceable limit set to protect public health.

c Secondary standard. Nonenforceable guideline regulating contaminant that may cause cosmetic effects or aesthetic effects (such as taste, odor, color, etc.) in drinking water.

d Total recoverable metal concentration shown. Surface water criteria apply to dissolved metal concentrations.

e Human health criteria.

Results of the testing indicate that the effluent meets federal drinking water standards. Based on average concentrations, only manganese exceeded the allowable limit.

Based on maximum concentrations detected during pilot plant operation, manganese, arsenic and nitrate exceed their respective standards in at least one sample, as described below:

- Manganese: Three samples collected. Results were 35, 53, and 122 μg/L, versus secondary standard 50 μg/L. The secondary standard is for aesthetic concerns, not health concerns. The concentration of manganese in the effluent is primarily related to the concentration of manganese in the influent, which results from manganese in the drinking water supply.

- Nitrate: The Village and the City of Duvall collected 29 samples. Average concentrations are shown in Table 4-2. The maximum reported concentration was 29 mg/L. Effluent nitrate concentrations from the full-scale plant are expected to be substantially less than those observed in effluent from the pilot-scale plant (see Section 4.5.5).

- Arsenic: Six samples were collected with the following results:

  1. Not Detected (ND) <2 μg/L
  2. ND<2 μg/L
  3. 2.7 μg/L
  4. ND<10 μg/L
  5. ND<10 μg/L
  6. 14.4 μg/L.

  The concentration of arsenic in the effluent is primarily related to the concentration of arsenic in the influent, which results from arsenic in the drinking water supply.

For the reasons stated above, these exceedances of federal drinking water standards do not indicate a problem for effluent infiltration.

4.5.5 Nitrogen Treatment

The Kubota pilot plant at Duvall did not demonstrate very good nitrogen removal results; however, the pilot plant was not expected to provide low effluent nitrogen levels because the pilot plant had incomplete nitrification and only partial denitrification. These results are not representative of the effluent quality that will be produced by the Village's wastewater treatment plant. The pilot plant at Duvall experienced lower than optimal temperatures during most of the operating period. The temperature in the mixed liquor in the pilot plant reached lows of 5°C. Nitrogen removal (nitrification and denitrification) is particularly sensitive to temperature and this was the cause of the poor results. The pilot unit was not shielded from the weather and due to wind and cold during the winter, the mixed liquor temperatures did not reflect the temperature in the main part of the plant. The Quil Ceda Wastewater Treatment Plant with its large concrete basins and covers will be able to maintain a much more optimal temperature, which will achieve significant nitrogen removal.

A case study of an MBR with nitrogen removal (Stephenson, et al, 2000) demonstrated that with recycle to an anoxic basin ahead of the MBR allowed for greater than 87 percent nitrogen removal with a total N of approximately 4.4 mg/L in the effluent. This was accomplished with a 6Q (i.e., 6 times inflow) recycle rate. The Quil Ceda Wastewater Treatment Plant is designed to have a 5Q recycle at design flows. During initial start-up and discharge to the infiltration basins, a greater recycle rate will be utilized, which will increase the level of nitrogen removal. At start-up, the wastewater treatment plant will be seeded with activated sludge with nitrifying and denitrifying bacteria to reduce the mixed liquor conditioning period and allow the plant to more rapidly achieve high nitrogen removal rates.

4.5.6 Sludge Disposal

Wasted sludge will be sent to either the existing Tulalip treatment plant or trucked to King County (under contract). No separate solids treatment or processing is included at the Quil Ceda Village treatment plant at this time.

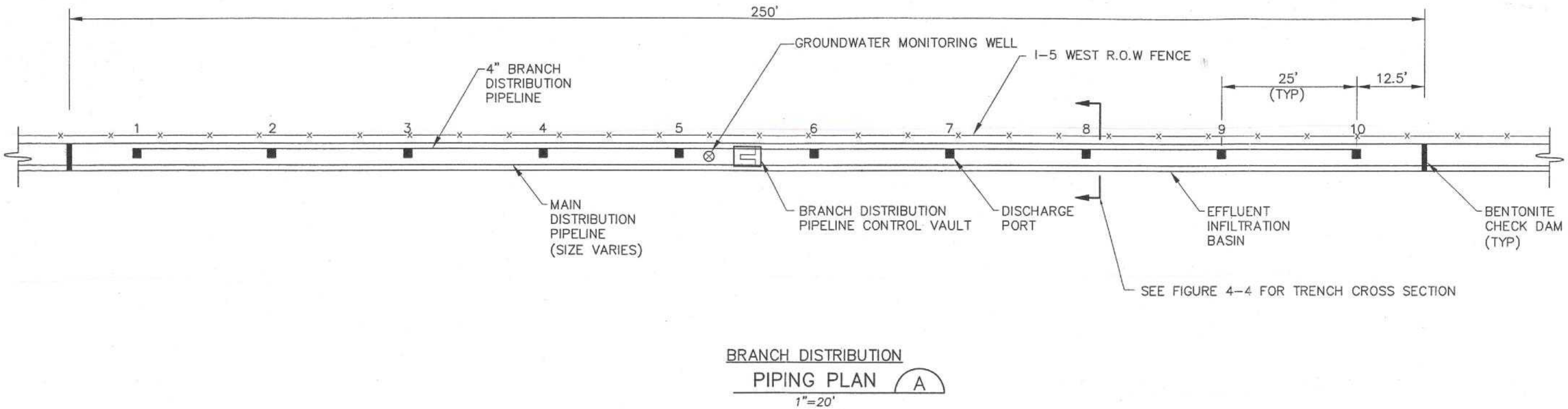
4.6 EFFLUENT INFILTRATION FACILITY DESCRIPTION AND ANALYSES

4.6.1 Effluent Infiltration System Description

This section describes the proposed effluent infiltration system, including construction plans, design criteria, and analyses. Preliminary construction plans for the system are provided in Appendix I.

Figure 1-1 shows the overall location of the proposed effluent infiltration system. Figure 4-3 shows the layout for one individual section of the system. The system is designed as a series of 19 identical sections, each 250 feet long and 5 feet wide. Each section will contain 10 individual discharge points located 25 feet apart. Flow to each section is controlled via a vault that contains a float valve, totalizing flow metal, and a globe valve for fine flow rate adjustment. Each discharge point will also have a valve to provide for flow rate control. These flow controls are necessary to provide equal flow to all sections and discharge points despite varying head losses due to 1) varying distribution piping lengths and numbers of fittings, and 2) elevation changes (ground elevation varies from 47 feet at the south end of the system to 62 feet at the north end of the system).

Parametrix, Inc.



FILE: 15981204F09
DATE: 04/03/02

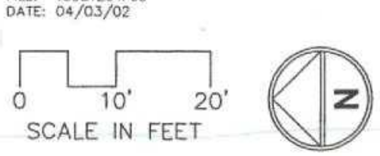


Figure 4-3
Typical Effluent Infiltration Trench Section
Tulalip Reservation

The float valve provides for restriction, and eventual shut-off, of flow to its respective infiltration trench section. Ponded water above the bottom of the trench is not expected to occur even under peak-hour flow conditions; however, the float valves are provided as a contingency measure. If one infiltration section shuts off, flow will naturally increase to the other sections. Sensors at the treatment plant will continuously monitor effluent discharge flow and pressure in the transmission pipeline to the infiltration system. Shutdown of one or more infiltration sections will cause an increase in back pressure due to increasing head loss as a result of high flows through distribution piping in each section. The treatment plant computer monitoring system will automatically alert the treatment plant operator to any unusual conditions so that the operator can investigate and take corrective action as necessary.

Figure 4-4 provides a cross-section of the infiltration system. The trench that comprises the infiltration system will be excavated to a depth of 4 feet to remove surficial topsoil and low-permeability silty sand, and then backfilled with a higher permeable material coarse sand to provide for rapid flow of injected water to all portions of the infiltration basins.

The construction plans in Appendix I show that plastic sheeting will be laid over the top of the infiltration trench. This plastic will be removed prior to startup of the effluent infiltration system. The purpose of the plastic is to prevent introduction of topsoil, landscape bark, and other foreign matter into the trench during construction of landscaping and other work adjacent to the trench.

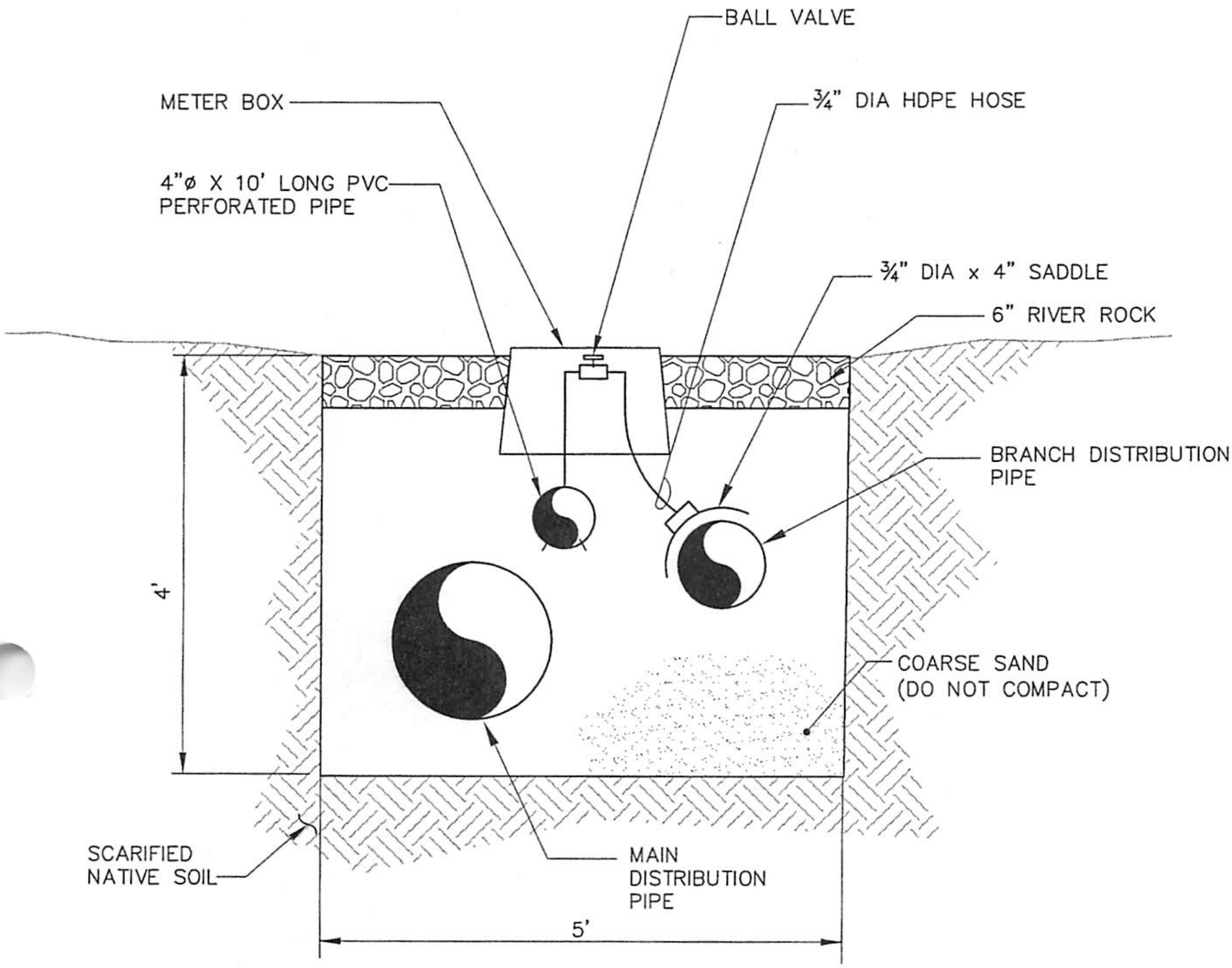
4.6.2 Hydraulic Design Criteria

Table 4-3 lists project design criteria related to infiltration rates and groundwater mounding. Effluent application rates, both average and peak day, are much less than the predicted allowable rate of 11 inches per hour identified through geotechnical studies (see Section 3.1).

Table 4-3. Summary of Effluent Infiltration Rates at Designed Flow Rates

	Flow Rates			Infiltration Rates (inches/hour)		
Effluent Infiltration Section	Average Day (gpd)	Peak Day (gpd)	Peak Hour (gpm)	Average Day	Peak Day	Peak Hour
N1 to N5	79,000	143,000	400	0.9	1.6	6.1
N6, N7, N8	36,000	64,000	170	0.6	1.2	4.6
N9, N10	0[a]	0[a]	0	–	–	–
S8, S9	24,000	43,000	120	0.6	1.2	4.6
S6, S7	32,000	57,000	160	0.9	1.6	6.1
S1 to S5	79,000	143,000	400	0.9	1.6	6.1
Total All Basins:	**250,000**	**450,000**	**1,250**	–	–	–

[a] Sections N9 and N10 are being constructed, but may be used infrequently or intermittently to avoid any potential conflicts with the casino stormwater infiltration system. Use may be limited to peak days or other high-flow periods.



NOTE:

1. SECURE FOLLOWING TAGS TO METER BOX LID:

   A. DISCHARGE POINT NO.

   B. "NON-POTABLE WATER DO NOT DRINK"

FILE: 15981204F4_3
DATE: 05/06/02

Figure 4-4
Effluent Infiltration Trench
Cross Section
Tulalip Reservation

Groundwater mounding was evaluated using a combined local/regional modeling analysis that predicts that groundwater mounding directly under the infiltration basins will be less than 3 feet. Appendix B describes the groundwater flow and mounding analysis in detail. The groundwater mounding analysis considered the following:

- Groundwater recharge from effluent infiltration.
- Groundwater recharge from precipitation in unpaved areas.
- Groundwater recharge from the casino stormwater infiltration basins.
- Groundwater recharge by stormwater infiltration basins for other major developments, including Wal-Mart and Home Depot.

Rainfall will be an insignificant source of water to the effluent infiltration system. Average rainfall at the site is approximately 33 inches per year. Only a portion of this water will actually infiltrate, since some will evaporate or run off as surface water. Rainfall will add approximately 10 percent to the volume of infiltrated effluent.

No surface water will run into the infiltration system, because the system is located on a "ridge" between Quil Ceda Boulevard and I-5. The ground to the west of the infiltration system drains westward to Quil Ceda Boulevard. The ground to the east of the infiltration system drains to the east to the I-5 drainage ditch.

4.6.3 Pollutant Loading Rates

Table 4-4 summarizes expected pollutant loading rates to the effluent infiltration basins based on the expected discharge quality described in Section 4.5. The analysis of pollutant loadings over the 3-year design life of the infiltration basins shows that loadings of total suspended solids, precipitatable solids, and biological matting will be insufficient to cause substantial reductions in infiltration rates. Any reduction in infiltration rates will be slight and well within the margin of safety that has been provided by incorporating a safety factor of 3 into the design infiltration rate (see Section 3.1). The pollutant loading analysis conservatively assumed the following:

- Total suspended solids of 0.4 mg/L. Note that all suspended solids should be less than 0.1 microns in diameter, much less than the pore diameter of the sandy soil (fine sand has a typical particle size of 100 to 400 microns).
- Total precipitatable solids of 171 mg/L, of which 50 percent precipitates in a 2-foot-deep zone immediately below the bottom of the coarse trench backfill.
- Carbonaceous Biological Oxygen Demand (CBOD) of 2.8 mg/L (after incorporating a safety factor of 2), of which $^1/_3$ is transformed into biological growth in soil pores in a 2-foot-deep zone immediately below the bottom of the coarse trench backfill.
- Soil porosity of 0.3.

Quil-Ceda

200+ 

- 33"/hour infilt. rate assumed frm. previous site work
- GW = 7-10 ft bgs

Infiltration Tests - 5000 gal/d for 90 days

- Original application approved = 250,000 gpd.
- Proposed rate = 300,000 gpd

Soil:

1 ft { sandy loam

1 ft { brown sand w/ 5% clay

{ Gray sand / no clay

Note that nitrification of total Kjeldahl nitrogen (TKN) yields minimal cell growth of only 0.05 gram cells per gram of nitrogen (oxidized), so biofouling from nitrification will be negligible.

Table 4-4. Summary of Infiltration Basin Loading Rates

Effluent Infiltration Section	Annual Loading Rates[a] (inches/year)			3-Year Design Life Loading Rate (inches)		
	TSS	Precipitated Material	Biological Matting	TSS and Precipitated Material	Biological Matting	Percent of Soil Pores Obstructed by TSS, Precipitates, and Biological Matting
N1 to N5	0.0031	0.32	0.01	0.96	0.02	14
N6, N7, N8	0.0023	0.24	0.01	0.71	0.02	10
N9, N10	–	–	–	–	–	–
S8, S9	0.0023	0.24	0.01	0.71	0.02	10
S6, S7	0.0031	0.32	0.01	0.95	0.02	14
S1 to S5	0.0031	0.32	0.01	0.95	0.02	14

[a] Assuming effluent flow rate of 250,000 gallons per day.

The total nitrogen concentration in the effluent is expected to average 4.4 mg/L (as N), as described in Section 4.5.5.

4.6.4 Oxygen Demand/Aerobic Conditions

It is desirable that the effluent infiltration system be maintained in an aerobic condition to avoid odorous conditions and to aid aerobic biodegradation of accumulated organic matter. Oxygen demand will occur from BOD and TKN in the effluent (ammonia and nitrite concentrations will be negligible). The wastewater treatment plant membrane tanks are well aerated, so effluent chemical oxygen demand will be minimal. Oxidation of 1 mg/L of TKN to nitrate requires 4.6 mg/L of oxygen. Conservatively assuming a BOD of 2.8 mg/L and a TKN of 2.7 mg/L, the total oxygen demand is:

2.8 mg/L BOD + 2.7 mg/L TKN (4.6 mg/L O per mg/L TKN) = 16 mg/L

The effluent is expected to have a dissolved oxygen concentration of approximately 6 mg/L; however, oxidation of TKN is a process that takes weeks to occur at temperatures less than 60°F. Due to pump cycling requirements, effluent will be discharged to the infiltration basins in "pulses" at a high flow rate of approximately 1,000 gpm (and hence a high infiltration rate of approximately 6 inches per hour) rather than in a continuous low flow manner. The duration of the times the effluent pumps are on will determine the day's total flow. This manner of effluent infiltration will maintain aerobic conditions at the vadose zone by drawing air into the soil pores as the pulse of applied effluent migrates downward. Additionally, wastewater flows will follow a diurnal cycle of peak flows in the morning and evening, with lesser flows at night. This diurnal cycling will also aid in maintaining aerobic soil conditions. Assuming that air is drawn into the subsurface soil at a rate of 0.1 L air per 1 L of effluent applied, an oxygen content in air of

21 percent, and a density of oxygen gas of 1,430 mg/L, oxygen would be resupplied to the effluent as follows:

$$\frac{0.21\,L\ \ O_2}{L\ air} \ x \ \frac{1{,}430\ mg\ O_2}{L\ O_2} \ x \ \frac{0.1\ L\ air}{1\ L\ water} = 30\ mg\ oxygen\ per\ L\ effluent$$

This resupply of oxygen is three times the net oxygen deficit of 10 mg/L Therefore, the effluent infiltration system, underlying vadose zone, and aquifer will be maintained in an aerobic condition.

Groundwater monitoring wells located directly under the effluent infiltration basins will allow for direct monitoring of shallow aquifer oxygen levels.

5. EFFLUENT MONITORING PROGRAM

The Village developed the following plans with the goal to ensure that 1) environmental programs and decisions are supported by data of the type and quality needed and expected for their intended use, and 2) the decisions involving the design, construction, and operation of environmental technology are supported by appropriate quality assured engineering standards and practices:

- Quality Management Plan (QMP) – Describes Tribal and Quil Ceda Village Management commitment, roles, and responsibilities to ensure the overall quality and integrity of environmental data and decisions.

- Quality Assurance Plan (QAP) – Describes specific quality control parameters and quality assurance procedures, including personnel roles and responsibilities to ensure that project quality objectives are achieved. Primarily applicable to public work director and staff.

- Sampling and Analysis Plan (SAP) – Describes specific sampling procedures and requirements. Primarily applicable to the wastewater treatment plant operator/field technician.

These plans are provided in Appendix J. Wastewater treatment plant operation and maintenance, including monitoring of operational parameters (i.e., flows, aeration rates, etc.), will be covered in a separate document prepared by the plant designer.

The SAP and QAP provide monitoring program requirements applicable to both effluent infiltration and discharge to surface water. The intent is to allow for a seamless transition in monitoring at such time as an NPDES permit is obtained, without requiring preparation of new monitoring program documents (although some modifications to the plans may be appropriate based on results of initial and routine monitoring activities).

The SAP addresses two primary issues:

- Effluent quality monitoring.

- Groundwater level monitoring.

Because effluent is expected to meet federal drinking water quality standards at the point of infiltration, The Village is proposing to complete no routine groundwater quality monitoring. Groundwater quality will be monitored only as a contingency measure (see Section 8.0).

5.1 EFFLUENT QUALITY MONITORING

Effluent will be monitored to document compliance with federal drinking water quality standards. Table 5-1 summarizes the proposed effluent monitoring parameters and frequencies for discharge to groundwater.

As such, it is premature to develop a detailed monitoring program for discharge to surface water at this time.

Table 5-1. Proposed Effluent Monitoring Parameters and Frequency

Parameter or Parameter Group	Sampling Frequency During Discharge to Effluent Infiltration System
Instrument Parameters	
Dissolved oxygen	Weekly
pH	Weekly
Specific conductance	Weekly
Turbidity	Continuous[a]
Conventional Parameters	
Alkalinity	Monthly for first year of operation
Ammonia	Weekly
BOD5	Weekly
Coliform, Fecal	Weekly
Coliforms, Total	First week, at 6 months, at 12 months
E. coli	First week, at 6 months, at 12 months
Cyanide	First week, at 6 months, at 12 months
Hardness	Monthly
Nitrate	Weekly
Nitrite	Weekly
Phosphorous	First week, at 6 months, at 12 months
TKN	Weekly
TSS	Monthly for first year of operation. Use turbidity as surrogate thereafter.
Metals	
Antimony	Monthly for first 3 months[b]
Arsenic	Monthly for first 3 months[b]
Barium	Monthly for first 3 months[b]
Beryllium	Monthly for first 3 months[b]
Cadmium	Monthly for first 3 months[b]
Chromium	Monthly for first 3 months[b]
Copper	Monthly for first 3 months[b]
Lead	Monthly for first 3 months[b]
Mercury	Monthly for first 3 months[b]
Nickel	Monthly for first 3 months[b]
Selenium	Monthly for first 3 months[b]
Silver	Monthly for first 3 months[b]
Thallium	Monthly for first 3 months[b]
Zinc	Monthly for first 3 months[b]

(Table Continues)

Table 5-1. Sampling Frequency (Continued)

Parameter or Parameter Group	Sampling Frequency During Discharge to Effluent Infiltration System
Volatile Organic Compounds[c]	First week, then every six months[b]
Pesticides[c]	First week, then every six months[b]
PCBs[c]	First week, then every six months[b]
TPH[c]	First week, then every six months[b]
Benzo(a)pyrene[d]	First week, then annually.[e]
Radionuclides	
Alpha	First week, then annually.[e]
Beta	First week, then annually.[e]
Radium 226/228 (combined)	First week, then annually.[e]

a Turbidity is continuously monitored as WWTP operational parameter to detect failure or deterioration of membrane treatment system.

b Monthly monitoring will continue for any compound detected at greater than 80 percent of its effluent limit. Otherwise, monitoring frequency will be reduced to annually.

c See list in Table 2-2 of the Quality Assurance Project Plan, Appendix J-2 (QAPP) (Parametrix, 2002).

d Can leach from coal tar linings in water storage tanks and pipe. However, Tulalip water system is newly constructed with no coal tar used.

e For first 3 years. Annual monitoring will continue for any compound detected at greater than 80 percent of its effluent limit. Otherwise, no further monitoring will be performed.

5.2 GROUNDWATER LEVEL MONITORING

Nineteen groundwater monitoring wells will be installed along the length of the effluent infiltration system to aid in monitoring groundwater levels and mounding due to infiltration of treated effluent. These wells will be monitored weekly.

Seven additional wells (B-1 to B-6, and P-3) located around the perimeter of the Village will aid in evaluating regional/seasonal variations in groundwater levels. Groundwater levels in these wells will be monitored monthly.

Table 5-1. Proposed Effluent Monitoring Parameters and Frequency

Parameter or Parameter Group	Sampling Frequency During Discharge to Effluent Infiltration System
Instrument Parameters	
Dissolved oxygen	Weekly
pH	Weekly
Specific conductance	Weekly
Turbidity	Continuous[a]
Conventional Parameters	
Alkalinity	Monthly for first year of operation
Ammonia	Weekly
BOD5	Weekly
Coliform, Fecal	Weekly
Coliforms, Total	First week, at 6 months, at 12 months
E. coli	First week, at 6 months, at 12 months
Cyanide	First week, at 6 months, at 12 months
Hardness	Monthly
Nitrate	Weekly
Nitrite	Weekly
Phosphorous	First week, at 6 months, at 12 months
TKN	Weekly
TSS	Monthly for first year of operation. Use turbidity as surrogate thereafter.
Metals	
Antimony	Monthly for first 3 months[b]
Arsenic	Monthly for first 3 months[b]
Barium	Monthly for first 3 months[b]
Beryllium	Monthly for first 3 months[b]
Cadmium	Monthly for first 3 months[b]
Chromium	Monthly for first 3 months[b]
Copper	Monthly for first 3 months[b]
Lead	Monthly for first 3 months[b]
Mercury	Monthly for first 3 months[b]
Nickel	Monthly for first 3 months[b]
Selenium	Monthly for first 3 months[b]
Silver	Monthly for first 3 months[b]
Thallium	Monthly for first 3 months[b]
Zinc	Monthly for first 3 months[b]

(Table Continues)

Revised 02/03

Table 5-1. Sampling Frequency (Continued)

Parameter or Parameter Group	Sampling Frequency During Discharge to Effluent Infiltration System
Volatile Organic Compounds[c]	First week, then every six months[b]
Pesticides[c]	First week, then every six months[b]
PCBs[c]	First week, then every six months[b]
TPH[c]	First week, then every six months[b]

[a] Turbidity is continuously monitored as WWTP operational parameter to detect failure or deterioration of membrane treatment system.

[b] Monthly monitoring will continue for any compound detected at greater than 80 percent of its effluent limit. Otherwise, monitoring frequency will be reduced to annually.

[c] See list in Table 2-2 of the Quality Assurance Project Plan, Appendix J-2 (QAPP) (Parametrix, 2002).

5.2 GROUNDWATER LEVEL MONITORING

Nineteen groundwater monitoring wells will be installed along the length of the effluent infiltration system to aid in monitoring groundwater levels and mounding due to infiltration of treated effluent. These wells will be monitored weekly.

Seven additional wells (B-1 to B-6, and P-3) located around the perimeter of the Village will aid in evaluating regional/seasonal variations in groundwater levels. Groundwater levels in these wells will be monitored monthly.

Rev'd 02/03

6. PLUGGING AND ABANDONMENT PLAN

The effluent infiltration system will be shut down and abandoned in-place. No specific plugging measures are proposed to be implemented following shutdown of the effluent infiltration system, because all effluent infiltration will occur subsurface in shallow trenches. The effluent infiltration system will have no deep wells or other vertical features that would provide a migration pathway for contaminated water into the aquifer.

All accumulations of solids and/or biological material will be located approximately 3 or more feet below ground surface, thus preventing any contact with people or wildlife. As discussed in Section 4.5.2, the wastewater effluent will be disinfected and meet federal drinking water standards. Thus, the accumulated material will be non-hazardous. Future excavation work that exposes these soils will require no special soil management procedures or institutional controls.

The surface of the effluent infiltration trenches will be finished in decorative fashion with landscaping rock (see plans in Appendix I). This material will be retained in place unless future landscaping changes require it to be removed and replaced with topsoil.

7. SCHEDULE

Table 7-1 presents the proposed project schedule.

Table 7-1. Proposed Project Schedule

Item	Date
Begin construction of wastewater treatment plant and water reuse pipelines.	April 2002
Obtain Rule Authorization of effluent infiltration system.	August 2002
Begin construction of effluent infiltration system.	August 2002
Complete construction of effluent infiltration system, including preliminary operation testing.	October 2002
Complete construction of wastewater treatment plant.	February 2003
Startup and test wastewater treatment plant (and effluent infiltration system). Begin regular effluent monitoring and reporting to EPA.	March 2003
Complete construction of the new Village casino. Open casino for business.	April 2003
Submit NPDES Permit application to EPA for discharge to surface water, including report documenting wastewater treatment plant effluent quality for first year of operation.[a]	May 2004
Obtain NPDES permit for discharge to surface water.[a]	May 2005
Design/construct surface water discharge facilities.[a]	September 2005
Begin effluent discharge to surface water. Shut down effluent infiltration system.[a]	October 2005

[a] Based on the planned development schedule, Quil Ceda Village may need to obtain an NPDES permit for discharge of treatment effluent to surface water in late 2005. This schedule is based on the current development plans and corresponding wastewater flow rate projections, which indicate that future wastewater flow rates will exceed the capacity of the effluent infiltration system in 2006. The actual schedule for obtaining an NPDES discharge permit to surface water will depend primarily on when an NPDES permit is needed, as a result of effluent flow rates approaching the capacity of the effluent infiltration system. Future wastewater flow rates may be less than anticipated (due to the amount or type of development that actually occurs), or the capacity of the effluent infiltration system may be greater than anticipated. In either event, Quil Ceda Village may continue to rely on the effluent infiltration system for disposal of treated wastewater as long as it is feasible, which could be indefinitely. Quil Ceda Village will closely monitor and evaluate actual wastewater flow rates versus projected flow rates, and closely monitor the capacity of the effluent infiltration system, to ensure that a decision to obtain an NPDES permit is made in a timely manner.

8. CONTINGENCY PLAN

This section addresses contingency measures applicable to several potential problems that might affect the effluent infiltration system. These potential problems include:

- Treatment plant effluent quality does not meet federal drinking water standards.
- Sanitary flows exceed effluent infiltration system capacity.
- NPDES discharge permit to surface water cannot be obtained.

These issues are discussed in more detail below.

8.1 EFFLUENT QUALITY EXCEEDING FEDERAL DRINKING WATER STANDARDS

Effluent quality is a function of a number of several parameters, including:

- Drinking water supply quality.
- Sanitary discharge water quality.
- Treatment plant removal efficiencies.

In the event monitoring indicates an exceedance of federal drinking water standards, the Village will complete an investigation to determine the cause of the exceedance. Possible investigation and corrective action steps could include:

- Collecting and analyzing samples of the drinking water supply.
- Collecting and analyzing samples of the effluent from specific sources of concern that discharge to the Village sewer system (see Sewer Utility Code Section 1.04.213), and requiring termination or pre-treatment of excessive discharges.
- Evaluating and improving treatment plant operations, maintenance, and/or equipment.
- Installing and monitoring new off-site groundwater monitoring wells and/or monitoring existing off-site drinking water wells to evaluate groundwater quality down-gradient of the effluent infiltration system.
- Providing alternative drinking water supplies to persons relying on potentially affected wells for drinking water.

The City of Marysville provides the Village's water supply; and therefore, the Village has minimal control over the quality of the drinking water supply. The City of Marysville's water supply is primarily from the City of Everett, although some additional water is obtained from local surface water and groundwater. The Village will work with the City of Marysville to address any water supply issues (such as attainment of the new 10-µg/L arsenic standard); however, water supply issues may be beyond the

Village's control. The Tribes may request a variance from EPA for meeting specific federal drinking water standards for substances that exceed the standards in the water supply.

The Tribes has an agreement with the City of Marysville allowing The Tribes to send up to 50,000 gpd of sewage to the Marysville POTW, which provides a contingency measure to reduce flow to the effluent infiltration system in the event of a wastewater plant malfunction or other problem. This may be useful particularly in the event of difficulties with system startup when wastewater flows will be relatively low.

An ultimate long-term remedy in the event of severe problems with the new treatment plant is construction of an overland pipeline to The Tribes' existing sewage treatment plant located on the west side of the reservation. This plant currently discharges to Puget Sound, and it has an NDPES Discharge Permit with sufficient excess capacity to accept flow from the Village; however, construction of the required pipeline (approximately 7 miles) would take 6 to 12 months from the time that it was determined to be needed.

8.2 INSUFFICIENT INFILTRATION CAPACITY

Insufficient infiltration capacity could occur for the following reasons:

- Higher than expected wastewater flows due to rapid development of the Village, higher than expected flows from specific businesses, and/or excessive interception and infiltration of groundwater into the sewer system.
- Lower than expected effluent infiltration capacity due to infiltration trench plugging and/or groundwater mounding.

The Village will monitor and evaluate sanitary flows to the treatment plant, and control the Village development, so that flows increase in an incremental and controlled manner and do not exceed allowed rates. The Village will limit development to a level that can be serviced by available utility capacity. The Village is implementing a stringent construction inspection and quality control to limit interception and infiltration of groundwater to the sewer to reasonable levels. The Village will attempt to identify and remedy specific sources of excessive groundwater interception and infiltration.

As described in Section 8.1, The Tribes has an agreement with the City of Marysville allowing The Tribes to send up to 50,000 gallons per day of sewage to the Marysville POTW, which provides a contingency measure to reduce flow to the effluent infiltration system.

Lower than expected infiltration rates are not expected to occur due to infiltration of only high quality effluent and short project life; however, it is possible that the trench infiltration rates could decrease to unacceptable levels. Trench plugging would be identified by the shut-off of float valves controlling flow to individual branch sections, and by ponding in the trenches while the groundwater surface remains below the trench bottom. Trench plugging could be investigated using test pits and/or soil cores within the infiltration trenches. Excessive groundwater mounding and elevated regional groundwater levels would be detected by routine groundwater level monitoring. Causes of lower than expected infiltration rates, and associated potential corrective actions, are described below:

- Biological Matting – For each section, revise the effluent application scheme to implement infiltration on an alternating cycle of application and resting. Alternatively, "shock chlorinate" the effluent with a moderately high dose of chlorine to kill accumulated biological material. Note that the effluent will normally be disinfected with ultraviolet light as described in Section 4.5.

- Solids Accumulation – Excavate the trench in sections to remove accumulated solids. Replace the trench backfill with new material. Scarified or over-excavate and replace trench bottom soils. Use temporary bypass piping to maintain flow to downstream infiltration sections.

- Groundwater Mounding – The gradual rise in effluent flows from low initial rates will provide adequate advanced warning of any potential problems. If excessive groundwater mounding is limited to an individual infiltration section (possibly due to variations in soil permeability), reduce the effluent flow to that section.

For all three causes listed above, additional infiltration capacity to offset lower than expected infiltration rates could be provided by constructing additional infiltration basins in the vacant lot north of Home Depot or other areas of the Village.

8.3 NPDES DISCHARGE PERMIT TO SURFACE WATER CANNOT BE OBTAINED

If needed, the Village believes that it will be able to obtain an NPDES Permit in a timely manner; however, it is possible that an NPDES Permit may not be obtained as planned. The Village would then have two options:

- Continue discharging treated effluent to the infiltration system.

- Discharge treated effluent to Puget Sound.

The latter option is described in Section 8.1, which states that the ultimate option for discharging treated effluent is constructing an overland pipeline to The Tribes' existing sewage treatment plant located on the west side of the reservation, with subsequent discharge of effluent to Puget Sound.

9. REFERENCES

American Society of Civil Engineers. 2001. *Standard Guidelines for Artificial Recharge of Ground Water*. EWR/ASCE 34-01.

Crites, Ronald W., Sherwood C. Reed, and Robert K Bastian. 2000. *Land Treatment Systems for Municipal and Industrial Wastes*. McGraw-Hill.

Pyne, R. David G. 1995. *Groundwater Recharge and Wells: A Guide to Aquifer Storage.*

Robins, N. S. 1998. *Groundwater Pollution, Aquifer Recharge and Vulnerability.* Geological Society Special Publication No. 130.

State of Florida. 2001. Chapter 62-610 Florida Administrative Code: Re-Use of Reclaimed Water and Land Application.

Stephenson, Judd, Jefferson, and Brindle. *Membrane Bioreactors for Wastewater Treatment.* IWA Publishing, 2000.

United States Environmental Protection Agency. 1981. *Process Design Manual, Land Treatment of Municipal Wastewater*. EPA 625/1-81-013, October.

United States Environmental Protection Agency. 1984. *Process Design Manual, Land Treatment of Municipal Wastewater, Supplement for Rapid Infiltration Systems*. EPA 625/1-81-013a, October.

United States Environmental Protection Agency. 1986. *Quality Criteria for Water 1986* (i.e., the "Gold Book"). EPA 440/5-86-001.